CITY OF PETALUMA
PETALUMA, CALIFORNIA

CONTRACT DOCUMENTS FOR

ELLIS CREEK CHEMCAL SYSTEM UPGRADE PROJECT PHASE I

CITY PROJECT NO. C66501840

(Notice Inviting Bids, Instructions to Bidders, Bid Forms, General Conditions, Special Provisions, Technical Specifications, Construction Agreement, Bond Forms, Project Drawings)

CITY OF PETALUMA - SONOMA COUNTY - CALIFORNIA

Questions concerning interpretation of improvement plans, special provisions, contract documents and bid items shall be directed to:

Department of Public Works and Utilities
1318 Redwood Way Suite 120
Petaluma, CA. 94954
Phone: (707) 776-3608 Fax: (707) 778-4508

Attention: Steve Worrell, P.E.

Office Hours: Monday thru Thursday - 8:00 to 5:00 p.m.

Bid Opening: October 10, 2024, at 2:00 p.m.

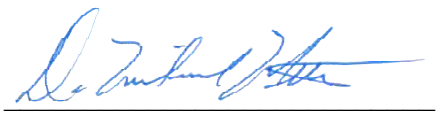
CITY OF PETALUMA
PETALUMA, CALIFORNIA

PETALUMA CHEMICAL SYSTEM UPGRADE

CITY PROJECT NO. C66501840

DUDEK
605 THIRD STREET
ENCINITAS, CALIFORNIA 92024

Prepared by: Dennis Michael Metts, P.E.



Dennis Michael Metts, P.E. #42586

August 30, 2024
Date

CITY OF PETALUMA
PETALUMA, CALIFORNIA

ELLIS CREEK CHEMICAL SYSTEM UPGRADE PROJECT PHASE I

CITY PROJECT NO. C66501840

CITY OF PETALUMA - SONOMA COUNTY - CALIFORNIA

Reviewed by: Steve Worrell, P.E.

_____
Steve Worrell, P.E. #C86908

___9/9/2024_____
Date

NOTICE INVITING BIDS

1. **RECEIPT OF BIDS**: Sealed Bids will be received at the office of the City Clerk of the City of Petaluma located at 11 English Street, Room 4, Petaluma, CA 94952-2610, until 2:00 PM (*enter time*) on Thursday, October 10, 2024, for the Ellis Creek Chemical System Upgrade Project Phase 1 (C66501840). Any Bids received after the specified time and date will not be considered. Fax and other electronically transmitted Bids will not be accepted.

2. **OPENING OF BIDS**: The Bids will be publicly opened and read at 2:00 PM (*enter time*) on Thursday, October 10, 2024 at the above-mentioned office of the CITY. The CITY reserves the right to postpone the date and time for opening of Bids at any time prior to the aforesaid date and time.

3. **COMPLETION OF WORK**: The WORK must be completed with 160 working days after the commencement date stated in the Notice to Proceed.

4. **DESCRIPTION OF WORK**: The WORK includes relocating the primary sodium hypochlorite storage and feed to the main dosing point adjacent to the WEPS. This will include a shelter structure to house equipment and all necessary ancillary equipment and components associated with a chemical storage and feed system, which include the following general components: •Chemical storage and feed pump containment area and shelter; •Three sodium hypochlorite storage tanks; •Chemical feed pump skid; •Chemical feed piping to the WEPS dosing point; •Recycle water (3W) connection; •Potable water (1W) connection; •Safety shower / eyewash station; •Tank fill connections for sodium hypochlorite deliveries; •Paved access roadway for chemical deliveries; •PLC to monitor and control new components; and •Electrical feed from existing and nearby MCC building.

5. **SITE OF WORK**: The site of the WORK is located: Ellis Creek Water Recycling Facility, 3890 Cypress Drive, Petaluma, CA 94954.

6. **OBTAINING CONTRACT DOCUMENTS**: The Contract Documents are entitled "ECWRF Chemical System Upgrade Phase 1".

   The Contract Documents may be obtained by 4:00 P.M., Monday through Thursday at the office of Public Works & Utilities, 202 North Mc Dowell Boulevard, Petaluma, CA 94954.

   If you would like to receive the bid document via the CITY's website, at no cost, please go to:

   - https://cityofpetaluma.org/bid-opportunities-2/
   - Fill out the Plan Holder's form by clicking on the Plan Holder's form link
   - Fill in all fields
   - Click on the submit button at the end of the form

   Submit the Plan Holder's form on-line automatically puts you on the CITY's Bidders List and you will be notified of any Addendums or information pertaining to the bis by email.

If you would like to purchase bid documents, please call Phone No. 707-776-3608, Attention: Steve Worrell, upon payment of $50 (non-refundable) for each set of Contract Documents (including technical specification and accompanying reduced scale drawings). The scale of the reduced drawings is about one-half of the original scale. At the Bidder's request and expense, the Contract Documents may be sent by overnight mail.

☒ Full-scale drawings are not available.

☐ If full-scale drawings are available and desired, they may be purchased at reproduction cost from .

7. **BID SECURITY**: Each Bid shall be accompanied by a certified or cashier's check or Bid Bond executed by an admitted surety in the amount of 10% percent of the Total Bid Price payable to the City of Petaluma as a guarantee that the Bidder, if its Bid is accepted, will promptly execute the Agreement. A Bid shall not be considered unless one of the forms of Bidder's security is enclosed with it. Upon acceptance of the Bid, if the Bidder refuses to or fails to promptly execute the Agreement the Bidder's security shall be forfeited to the CITY.

8. **CONTRACTOR'S LICENSE CLASSIFICATION**: In accordance with the provisions of California Public Contract Code Section 3300, the CITY has determined that the CONTRACTOR shall possess a valid Class A license at the time that the Contract is awarded. Failure to possess the specified license shall render the Bid as non-responsive and shall act as a bar to award of the Contract to any bidder not possessing said license at the time of award pursuant to labor Code Section 1725.5, subject to limited legal exceptions.

9. **PREFERENCE FOR MATERIAL**: Any specification designating a material, product, thing, or service by specific brand or trade name, followed by the words "or equal" or "or equivalent" is intended only to indicate quality and type of item desired. Substitute products will be considered prior to award of the Contract in accordance with Section 3400 of the California Public Contract Code. The Bidder will submit data substantiating its request for a substitution of "an equal" item within 14 days following submission of its Bid. Substantiation date will conform to the requirements of the instructions for Proposed Substitutions of "or equal" items contained in the bid Forms. The ENGINEER will make a determination of approval of rejection of the proposed substitution prior to the award of the Contract. No request for substitution of "an equal" items will be considered by the ENGINEER after award of the Contract. This provision does not apply to materials, products, things, or services that may lawfully be designated by a specific brand or trade name under Public Contract Code Section 3400(c).

10. **REJECTION OF PROPOSALS**: The CITY reserves the right to reject all or any part of all bids submitted, waive informalities and irregularities, and will not, to the extent allowed by law, be bound to accept the lowest bid.

11. **BIDS TO REMAIN OPEN**: The Bidder shall guarantee the total bid price for a period of 90 calendar days from the date of bid opening.

12. **CALIFORNIA PREVAILING WAGE RATE REQUIREMENTS**: In accordance with the provisions of California Labor Code Sections 1770,1773, 1773.1, and 1773.7 as amended, the Director of the Department of Industrial Relations has determined the general prevailing rate of per diem wages in accordance with the standards set forth in Section 1773 for the locality in which the WORK is to be performed. A copy of said wage rates is on file at the office of the City Clerk and is available to any interested party upon request. A copy of the prevailing rate of per diem wages are also online at http://www.dir.ca.gov/DLSR. Each Contractor and Subcontractor must pay no less than the specified rates to all workers employed to work on the Project. The schedule of per diem wages is based upon a working day of eight hours. The rate for holiday and overtime work must be at least time and one-half. It shall be mandatory upon the CONTRACTOR to whom the WORK is awarded and upon any subcontractor under the CONTRACTOR to pay not less than said specified rates to all workers employed by them in the execution of the WORK. The Contract will be subject to compliance monitoring and enforcement by the Department of Industrial Relations under labor Code Section 1771.4. Additionally, CONTRACTOR shall post job sit notices s required by Labor Code section 1771.4.

13. **LABOR COMPLIANCE PURSUANT TO CALIFORNIA LABOR CODE §1771.1**: A contractor of subcontractor shall not be qualified to bid on, be listed in a bid proposal, subject to the requirement of Section 4104 of the Public Contract Code or engage in the performance of any contract for public work, as defined in Division 2, Part 7, Chapter 1 of the Labor Code, unless currently registered and qualified to perform public work pursuant to Section 1725.5. It is not a violation of this section for an unregistered contractor to submit a bid that is authorized by Section 7029.1 of the Business and Professions Code or by Section 10164 or 20103.5 of the Public Contract Code, provided the contractor is registered to perform public work pursuant to Section 1725.5 at the time contract is awarded.

14. **RETAINAGE FROM PAYMENTS**: The CONTRACTOR may elect to receive 100 percent of payments due under the Contract Documents from time to time, without retention of any portion of the payment by the CITY, by depositing securities of equivalent value with the CITY in accordance with the provisions of Section 22300 of the Public Contract Code. Alternatively, the CONTRACTOR may request, and the CITY shall make payment of retentions earned directly to the escrow agent at the expense of CONTRACTOR. At the expense of the CONTRACTOR, the CONTRACTOR may direct the investments of the payments into securities and the CONTRACTOR shall receive the interest earned on the investments upon the same terms as provided in Section 22300 of the Public Contract Code for securities deposited by the CONTRACTOR. The CONTRACTOR shall be responsible for paying all fees for the expense incurred by the escrow agent in administering the escrow account and all expenses of the CITY. These expenses and payment terms shall be determined by the CITY's Finance Director or their designee and the escrow agent. Upon satisfactory completion of the

WORK, the CONTRACTOR shall receive from the escrow agent all securities, interest, and payments received by the escrow agent from the CITY, pursuant to the terms of Section 22300 of the Public Contract Code. Such securities, if deposited by the CONTRACTOR, shall be valued by the CITY, whose decision on valuation of the securities shall be final. Securities eligible for investment under this provision shall be limited to those listed in Section 16430 of the Government Code, bank or savings and loan certificates of deposit, interest-bearing demand deposit accounts, standby letters or credit, or any other security mutually agreed to by the CONTRACTOR and the CITY.

15. **PAYMENT BOND**: Pursuant to and in accordance with California Civil Code Section 9550, a payment bond must be filed if the expenditure for the WORK is in excess of Twenty-Five Thousand Dollars ($25,000.00).

16. **PRE-BID CONFERENCE VISITS**: [At least one box below MUST be checked]

☐ Check if no pre-bid conference/site is to be held.

☐ Mandatory pre-bid conference/site visit to be held: Prospective bidders are required to attend a mandatory pre-bid conference/site visit at _____ (*enter time*) on _____, at the _____, offices at _____. Prospective bidders that fail to attend the mandatory pre-bid conference/site visit will be ineligible to bid on the project. Following the conference at City offices, City staff and prospective bidders will meet at the project Site.

Transportation to the project site will be the responsibility of prospective bidders. The purposes of the conference/site visit are to discuss the scope of the project and bidding requirements and to acquaint bidders with Site conditions.

No information communicated at the pre-bid conference/site visit may amend the project bidding requirements. Project bidding requirements may only be amended by addenda issued by authorized City officials. Following the pre-bid conference/site visit, prospective bidders may submit detailed technical questions in writing. If warranted, the City may respond to such questions by addenda.

☒ Non-Mandatory pre-bid conference/site visit to be held: Prospective bidders are invited to attend a non-mandatory pre-bid conference/site visit at 10:00 AM (*enter time*) on Tuesday, September 17, 2024 at the Ellis Creek Water Recycling Facility at 3890 Cypress Drive, Petaluma CA 94954. Following the conference City offices, City staff and prospective bidders will meet at the project Site.
Transportation to the project site will be the responsibility of prospective bidders. The purposes of the conference/site visit are to discuss the scope of the project and bidding requirements, and to acquaint bidders with Site conditions.

No information communicated at the pre-bid conference/site visit may

amend the project bidding requirements. Project bidding requirements may only be amended by addenda issued by authorized City officials. Following the pre-bid conference/site visit, prospective bidders may submit detailed technical questions in writing. If warranted, the CITY may respond to such questions by addenda.

17. **PROJECT ADMINISTRATION**: All communications relative to the WORK shall be directed to the ENGINEER prior to opening of the Bids.

18. **FINDING OF SUBSTANTIAL COMPLEXITY:** Pursuant to Public Contract Code Section 7201(b)(3) the CITY's Public Work's Director has found that the WORK is substantially complex due to: the amount of technical and scientific knowledge needed to complete the project; the amount of resources needed to complete the project including amount of days, workers, and labor; the urgency for project completion; the amount of tasks needed to complete the project; the number of organizational stakeholders needed to satisfy; the environmental complexity of the conditions; and in particular N/A and therefore this is a unique project that is not regularly performed and requires a higher retention amount than 5 percent.

    Notwithstanding Public Contract Code Section 7201 or any other law or regulation that purports to provide otherwise, public contracting is a quintessential municipal affair, subject to charter cities' home rule power, and the California Constitution grants charter cities supreme authority over municipal affairs, which include public Works, procurement, and the mode of municipal contracting (See, Public Contract Code Section 1100.7 and e.g., Bishop v. City of San Jose (1969) 1 C3rd 56)., and it is the courts, not the legislature, that determines which matters are municipal affairs (see, e.g., *California Federal Savings and Loan v. City of Los Angeles* (1991) 54 C3d 1): and

Article X, Section 67 of the Petaluma Charter provides in pertinent part:

> …no progressive payments can be provided for or made at any time which, with prior payments, if there have been such, shall exceed in amount at that time ninety percent of the value of the labor done and the materials used up to that time, and no contract shall provide for or authorize or permit or permit the payment of more than ninety percent of the contract price before the completion of the work done under said contract and the acceptance thereof…; and
>
> City charters are documents of limitation and a restriction on the City Council's powers imposed by the voters (see, e.g., *City of Glendale v. Trondsen* (1957) 48 C2d 93) and, as a result, the City Council's contracting power is limited by the retention requirement in Article X, Section 67, and the City Council and City Council and City staff lack the power to provide for public works contract retention other than as specified in the City Charter.

19. **GOVERNMENT CODE SECTION 1090:** The successful Bidder may be precluded from competing for, or participating in, subsequent contracts that result from or relate to the WORK performed pursuant to this Bid. The ethics laws that apply to the City and all its consultants, contractors, and vendors include California Government Code Section 1090 and following, which prohibits government officials, employees, and contractors from participating in making government contracts in which the official, employee or contractor has a financial interest. Because City contractors always have a financial interest in their City contracts, the Section 1090 prohibition regarding City contractors focuses on whether a contractor is or would be "making a government contract" in a quasi-governmental capacity for purposes of Section 1090. Section 1090 prohibits City contractors from using their role as a contractor to influence how the City spends the public's funds in a way that benefits the contractor. Penalties for violating Section 1090 are severe, and may include felony criminal penalties, permanent disqualification from holding public office in California, disgorgement of any benefit received by the financially interested contractor, civil and administrative penalties, and voiding of the prohibited contract.

NAME:	Steve Worrell
ADDRESS:	1318 Redwood Way
	Suite 120
	Petaluma, CA 94954
PHONE:	707-776-3608

20. **CITY'S RIGHTS RESERVED**: The CITY reserves the right to reject any or all bids, to waive any minor irregularity in a bid, and to make awards to the lowest responsive, responsible bidder as it may best serve the interest of the CITY.

CITY: Petaluma

BY: Caitlin Cooley

DATE: Sept 5, 2024

END OF INVITING BIDS

INSTRUCTIONS TO BIDDERS

1. DEFINED TERMS. Terms used in these Instructions to Bidders and the Notice Inviting Bids which are defined in the General Conditions have the meanings assigned to them in the General Conditions. The term "Bidder" means one who submits a Bid directly to CITY, as distinct from a sub-bidder, who submits a price or quote to a Bidder.

2. LOCAL BUSINESS LICENSE. All CONTRACTORS, including subcontractors, not already having a local business license for the work contemplated, will be required to secure the appropriate license before a Contract can be executed.

3. INTERPRETATIONS AND ADDENDA.

3.1 All questions about the meaning or intent of the Contract Documents are to be directed to the ENGINEER. Additions, deletions, or revisions to the Contract Documents considered necessary by the ENGINEER in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by the ENGINEER as having received the Contract Documents. Questions received less than 14 days prior to the date of Bids may not be answered. Only answers to such questions issued by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

3.2 Addenda may also be issued to make other additions, deletions, or revisions to the Contract Documents.

3.3 Bidders shall make no special interpretation or inference of intent from differing formats in the Technical Specifications.

4. BIDDER'S EXAMINATION OF CONTRACT DOCUMENTS AND SITE.

4.1 It is the responsibility of each Bidder before submitting a Bid:

A. To examine thoroughly the Contract Documents and other related data identified in the Bidding Documents (including "technical" data referred to below);

B. To visit the site to become familiar with local conditions that may affect cost, progress, or performance of the WORK;

C. To consider federal, state, and local Laws and Regulations that may affect cost, progress, or performance of the WORK;

D. To study and carefully correlate the Bidder's observations with the Contract Documents; and

E. To notify the ENGINEER of all conflicts, errors, ambiguities, or discrepancies in or between the Contract Documents and such other related data.

4.2 Reference is made to the Supplementary General Conditions for identification of:

A. Those reports of explorations and tests of subsurface conditions at the site which have been utilized by the ENGINEER in the preparation of the Contract Documents.

B. Those drawings of physical conditions in or relating to existing surface and subsurface conditions (except Underground Utilities) which are at or contiguous to the site which have been utilized by the ENGINEER in the preparation of the Contract Documents.

C. Those environmental reports or drawings relating to Asbestos, Hazardous Waste, PCBs, Petroleum, and/or Radioactive Materials identified at the site which have been utilized by the ENGINEER in the preparation of the Contract Documents.

D. The ENGINEER makes no representation as to the completeness of the reports or drawings referred to in Paragraphs 4.2A, 4.2B, and 4.2C. above or the accuracy of any data or information contained therein. The Bidder may rely upon the accuracy of the technical data contained in such reports and drawings. However, the Bidder may not rely upon any interpretation of such technical data, including any interpretation or extrapolation thereof, or any non-technical data, interpretations, and opinions contained therein.

4.3 Copies of reports and drawings referred to in Paragraph 4.2 will be made available by the CITY to any Bidder on request, if said reports and drawings are not bound herein. Those reports and drawings are not part of the Contract Documents, but the technical data contained therein upon which the Bidder is entitled to rely, are incorporated herein by reference.

4.4 Information and data reflected in the Contract Documents with respect to Underground Utilities at or contiguous to the site are based upon information and data furnished to the ENGINEER by the owners of such Underground Utilities or others, and the CITY does not assume responsibility for the accuracy or completeness thereof unless it is expressly provided otherwise in the Supplementary General Conditions.

4.5 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders on subsurface conditions, Underground Utilities, and other physical conditions, and possible changes in the Contract Documents due to differing conditions appear in Paragraphs 4.2, 4.3, and 4.4 of the General Conditions.

4.6 Before submitting a Bid, each Bidder will, at Bidder's own expense, make or obtain any additional examinations, investigations, explorations, tests, and studies and obtain any additional information and data which pertain to the physical conditions (surface,

subsurface, and Underground Utilities) at or contiguous to the site or otherwise which may affect cost, progress, or performance of the WORK and which the Bidder deems necessary to determine its Bid for performing the WORK in accordance with the time, price, and other terms and conditions of the Contract Documents.

4.7 On request a minimum of 2 working days in advance, the ENGINEER will provide each Bidder access to the site to conduct such examinations, investigations, explorations, tests, and studies as each Bidder deems necessary for submission of a Bid. Location of any excavation or boring shall be subject to prior approval of ENGINEER and applicable agencies. Bidder shall fill all holes, restore all pavement to match existing structural section, and shall clean up and restore the site to its former condition upon completion of such explorations. ENGINEER reserves the right to require Bidder to execute an Access Agreement with the CITY prior to accessing the site.

4.8 The lands upon which the WORK is to be performed, rights-of-way, and easements for access thereto and other lands designated for use by the CONTRACTOR in performing the WORK are identified in the Contract Documents. All additional lands and access thereto required for temporary construction facilities or storage of materials and equipment are to be provided by the CONTRACTOR. Easements for permanent structures or permanent changes in existing structures are to be obtained and paid for by the CITY unless otherwise provided in the Contract Documents.

4.9 The submission of a Bid will constitute an incontrovertible representation by the Bidder that the Bidder has complied with every requirement of this Paragraph 4 and the following:

A. That the Bid is premised upon performing the WORK required by the Contract Documents without exception and such means, methods, techniques, sequences, or procedures of construction (if any) as may be required by the Contract Documents;

B. That Bidder has given the ENGINEER written notice of all conflicts, errors, ambiguities, and discrepancies in the Contract Documents and the written resolution thereof by the ENGINEER is acceptable to the Bidder; and

C. That the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the WORK.

5. BID FORMS. The Bid shall be submitted on the Bid Forms provided by the City. All blanks on the Bid Forms shall be completed in ink. All names must be printed below the signatures. The Bid shall be submitted in a sealed envelope which shall be plainly marked in the upper left hand corner with the name and address of the Bidder and shall bear the words "BID FOR" followed by the title of the Contract Documents for the WORK, the name of the CITY, the address where Bids are to be delivered or mailed to, and the date and hour of opening of Bids.

5.2 The Bid must set forth the name and location of the place of business of each subcontractor who will perform work or labor or render service to the prime contractor in or about the construction of the WORK, or a subcontractor licensed by the State of California who, under subcontract to the prime contractor, specially fabricates and installs a portion of the WORK according to detailed Drawings contained in the plans and specifications, in an amount in excess of one-half of 1 percent of the prime contractor's total bid or, in the case of bids or offers for the construction of streets and highways, including bridges, in excess of one-half of 1 percent of the prime contractor's total bid or ten thousand dollars ($10,000), whichever is greater.

6. CERTIFICATES.

6.1 Bids by corporations must be executed in the corporate name by the president, a vice-president, or other corporate officer. Such Bid shall be accompanied by the enclosed Certificate of Authority to sign, attested by the secretary or assistant secretary, and with the corporate seal affixed. The corporate address and sate of incorporation must appear below the signature.

6.2 Bids by partnerships must be executed in the partnership name and be signed by a managing partner, accompanied by the enclosed Certificate of Authority to sign, and his/her title must appear under the signature and the official address of the partnership must appear below the signature.

6.3 Bids by joint venture must be executed in the joint venture name and be signed by a joint venture managing partner, accompanied by the enclosed Certificate of Authority to sign, and his/her title must appear under the signature and the official address of the joint venture must appear below the signature.

7. DISQUALIFICATION OF BIDDERS. More than one Bid from an individual, firm, partnership, corporation, or association under the same or different names will not be considered. If the CITY believes that any Bidder is interested in more than one Bid for the WORK contemplated, all Bids in which such Bidder is interested will be rejected. If the CITY believes that collusion exists among the Bidders, all Bids will be rejected. A party who has quoted prices to a bidder is not hereby disqualified from quoting prices to other Bidders, or from submitting a Bid directly for the WORK. If a Bidder is not registered with the Department of Industrial Relations pursuant to Labor Code Section 1725.5 and Section 1771.1, then the Bid may be rejected as non-responsive.

8. QUANTITIES OF WORK. The quantities of work or material stated in unit price items of the Bid are supplied only to give an indication of the general scope of the WORK; the OWNER does not expressly or by implication agree that the actual amount of work or material will correspond therewith, and reserves the right after award to increase or decrease the quantity of any unit price item of the WORK by an amount up to and including 25 percent of any Bid item in its entirety, or to add additional Bid items up to and including an aggregate total amount not to exceed 25 percent of the Bid price.

9. SUBSTITUTE OR "OR EQUAL" ITEMS. Whenever materials or equipment are specified or described in the Contract Documents by using the name of a particular manufacturer and the name is followed by the words "or equal", the Bidder may write the name of a substitute manufacturer (which the Bidder considers as an "or equal") in the List of Proposed Substitutions in the Bid Forms. The ENGINEER will make a determination of approval or rejection of the proposed substitution prior to award of the Contract. No request for substitution of an "or equal" item will be considered by the ENGINEER after award of the Contract. The procedure for the submittal of substitute or "or equal" products is contained in the Bid Forms. The Bidder shall not be relieved of any obligations of the Contract Documents or be entitled to an adjustment in the Contract Price in the event any proposed substitution is not approved.

10. COMPETENCY OF BIDDERS. In selecting the lowest responsive, responsible Bidder, consideration will be given not only to the financial standing but also to the general competency of the Bidder for the performance of the WORK covered by the Bid. To this end, each Bid shall be supported by a statement of the Bidder's experience as of recent date including: (a) all projects worked on by the Bidder over the past three (3) years including the contract amount for each project; (b) all complaints made against the Contractor's license in the past ten (10) years; and (c) all claims and lawsuits presented or filed in the last five (5) years, regardless of the form, regarding any public works project.

11. SUBMISSION OF BIDS. The Bid shall be delivered by the time and to the place stipulated in the Notice Inviting Bids. It is the Bidder's sole responsibility to see that its Bid is received in proper time and at the proper place.

12. BID SECURITY, BONDS, AND INSURANCE. Each Bid shall be accompanied by a certified or cashier's check or approved Bid Bond in the amount stated in the Notice Inviting Bids. Said check or bond shall be made payable to the CITY and shall be given as a guarantee that the Bidder, if awarded the WORK, will enter into an Agreement with the CITY and will furnish the necessary insurance certificates, Payment Bond, and Performance Bond. In case of refusal or failure to enter into said Agreement, the check or Bid Bond, as the case may be, shall be forfeited to the CITY. If the Bidder elects to furnish a Bid Bond as its Bid security, the Bidder shall use the Bid Bond form bound herein. Bid Bonds shall comply with the requirements applicable to payment and performance bonds in the General Conditions.

12.1 BIDDING CAPACITY. Each Bid shall be accompanied by a list of the projects currently being worked on by Bidder, their size, contract price, scheduled completion date, location, and owner. Additionally, Bidder shall provide certified evidence of its current bonding capacity.

13. DISCREPANCIES IN BIDS. In the event there is more than one Bid item in a Bid Schedule, the Bidder shall furnish a price for all Bid Items in the Schedule, and failure to do so will render the Bid non-responsive and shall cause its rejection. In the event there are unit price Bid items in a Bidding schedule and the amount indicated for a unit price Bid item does not equal the product of the unit price and quantity, the unit price shall

govern and the amount will be corrected accordingly, and the BIDDER shall be bound by said correction. In the event there is more than one Bid item in a Bid Schedule and the total indicated for the Schedule does not agree with the sum of the prices Bid on the individual items, the prices Bid on the individual items shall govern and the total for the Schedule will be corrected accordingly, and the BIDDER shall be bound by said correction.

14. MODIFICATIONS AND UNAUTHORIZED ALTERNATIVE BIDS. Unauthorized conditions, limitations, or provisos attached to the Bid shall render it informal and may cause its rejection as being non-responsive. The Bid forms shall be completed without interlineations, alterations, or erasures in the printed text. Alternative Bids will not be considered unless called for. Oral, telegraphic, or telephonic Bids or modifications will not be considered.

15. WITHDRAWAL OF BID. The Bid may be withdrawn by the Bidder by means of a written request, signed by the Bidder or its properly authorized representative. Such written request must be delivered to the place stipulated in the Notice Inviting Bids for receipt of Bids prior to the scheduled closing time for receipt of Bids.

16. BID PROTEST. Any Bid protest must be submitted in writing to the City Manager before 5:00 p.m. on the fifth (5^{th}) working day following Bid opening.

    A. The initial protest document must contain a complete statement of the basis for the protest, and all supporting documentation.

    B. The party filing the protest must have actually submitted a Bid for the WORK. A subcontractor of a party submitting a Bid for the WORK may not submit a Bid protest. A party may not rely on the Bid protest submitted by another Bidder, but must timely pursue its own protest.

    C. The protest must refer to the specific portion of the bid document which forms the basis for the protest.

    D. The protest must include the name, address and telephone number of the person representing the protesting party.

    E. The party filing the protest must concurrently transmit a copy of the initial protest document and any attached documentation to all other parties with a direct financial interest which may be adversely affected by the outcome of the protest. Such parties shall include all other Bidders who appear to have a reasonable prospect of receiving an award depending upon the outcome of the protest.

    F. The CITY will give the protested Bidder five (5) working days after the receipt of the protest to submit a written response. The responding Bidder shall transmit the response to the protesting Bidder concurrent with delivery to the CITY.

G. The procedure and time limits set forth in this paragraph are mandatory and are the Bidder's sole and exclusive remedy in the event of Bid protest. The Bidder's failure to comply with these procedures shall constitute a waiver of any right to further pursue the Bid protest, including filing a Government Code Claim or legal proceedings. A Bidder may not rely on a protest submitted by another Bidder, but must timely pursue its own protest.

H. If the CITY determines that a protest is frivolous, the protesting bidder may be determined to be non-responsible and that bidder may be determined to be ineligible for future contract awards.

17. AWARD OF CONTRACT. Award of the contract, if awarded, will be made to the lowest responsive, responsible Bidder whose Bid complies with the requirements of the Contract Documents. Unless otherwise specified, any such award will be made within the period stated in the Notice Inviting Bids that the bids are to remain open. Unless otherwise indicated, a single award will be made for all the Bid items in an individual Bid Schedule. In the event the WORK is contained in more than one Bid Schedule, the CITY may award Schedules individually or in combination. In the case of two Bid Schedules which are alternative to each other, only one of such alternative schedules will be awarded. The CITY may condition the award upon the Bidder's timely submission of all items required by the Contract Documents, including, but not limited to the executed Agreement, performance, labor and materials, and maintenance bonds, and required certificates of insurance and endorsements.

18. RETURN OF BID SECURITY. Within 14 days after award of the contract, the CITY will, if requested, return the Bid securities accompanying such Bids that are not being considered in making the award. All other Bid securities will be held until the Agreement has been finally executed. They will then be returned, if requested, to the respective Bidders whose Bids they accompany.

19. EXECUTION OF AGREEMENT. The Bidder to whom award is made shall execute a written Agreement with the CITY on the form of agreement provided, shall secure all insurance, and shall furnish all certificates and bonds required by the Contract Documents within five (5) working days after receipt of Notice of Award from the CITY. Failure or refusal to enter into an Agreement as herein provided or to conform to any of the stipulated requirements in connection therewith shall be just cause for annulment of the award and forfeiture of the Bid security. If the lowest responsive, responsible Bidder refuses or fails to execute the Agreement, the CITY may award the Contract to the second lowest responsive, responsible Bidder. If the second lowest responsive, responsible Bidder refuses or fails to execute the Agreement, the OWNER may award the contract to the third lowest responsive, responsible Bidder. On the failure or refusal of such second or third lowest Bidder to execute the Agreement, each such Bidder's Bid securities shall be likewise forfeited to the CITY.

20. LIQUIDATED DAMAGES. Provisions for liquidated damages, if any, are set forth in the Agreement.

21. WORKERS' COMPENSATION REQUIREMENT. The Bidder should be aware that in accordance with Section 3700 of the California Labor Code it will, if awarded the Contract, be required to secure the payment of compensation to its employees and execute the Workers' Compensation Certification in the form contained in these Contract Documents.

22. NON-COLLUSION AFFIDAVIT. Bidders must execute the following affidavit and submit the same with his/her bid:

23. MATERIALS SUPPLIERS LIST. Bidders and their subcontractors must complete the List of Materials Suppliers and Material Guarantee form provided with the Bid Forms and must submit the completed form with the Bid.

END OF INSTRUCTIONS TO BIDDERS

BID PROPOSAL CERTIFICATE
(if Corporation)

STATE OF CALIFORNIA)
) ss:
COUNTY OF)

I HEREBY CERTIFY that a meeting of the Board of Directors of the _____ _____, a corporation existing under the laws of the State of _____, held on _____, 20____, the following resolution was duly passed and adopted:

"RESOLVED, that _____, as _____ President of the Corporation, be and is hereby authorized to execute the Bid Proposal dated _____, 20____, for the _____ _____ project, in the City of Petaluma, and that his/her execution thereof, attested by the Secretary of the Corporation, and with the Corporate Seal affixed, shall be the official act and deed of this Corporation."

I further certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the official seal of the corporation this _____, day of _____, 20____.

_____
Secretary

(SEAL)

BID PROPOSAL CERTIFICATE
(if Partnership)

STATE OF CALIFORNIA)
) ss:
COUNTY OF)

I HEREBY CERTIFY that a meeting of the Partners of the _____
_____,
a partnership existing under the laws of the State of _____, held on _____, 20____, the following resolution was duly passed and adopted:

"RESOLVED, that _____, as the General Partner of the Partnership, be and is hereby authorized to execute the Bid Proposal dated _____, 20___, for the _____ project, in the City of Petaluma and that his/her execution thereof, attested by the _____ shall be the official act and deed of this Partnership."

I further certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand this _____ day of _____, 20___.

_____
Partner

(SEAL)

BID PROPOSAL CERTIFICATE
(if Joint Venture)

STATE OF CALIFORNIA)
) ss:
COUNTY OF)

I HEREBY CERTIFY that a meeting of the Principals of the _____
_____
_____
a joint venture existing under the laws of the State of _____, held on _____, 20___, the following resolution was duly passed and adopted:

"RESOLVED, that _____, as _____ of the joint venture, be and is hereby authorized to execute the Bid Proposal dated _____, 20___, for the _____ _____ project, in the City of Petaluma, and that his/her execution thereof, attested by the _____ shall be the official act and deed of this Joint Venture."

I further certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand this _____, day of _____, 20___.

_____
Managing Partner

(SEAL)

BID PROPOSAL CERTIFICATE
(if Proprietorship)

STATE OF CALIFORNIA)
) ss:
COUNTY OF)

I HEREBY CERTIFY that _____, as owner of _____ that I am authorized to execute the Bid Proposal dated _____, 20____, for the _____ _____ project, in the City of Petaluma, and that my execution thereof shall be the official act and deed of this proprietorship.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the official seal of the corporation this _____, day of _____, 20____.

_____
Owner

(SEAL)

SECTION I

BID FORMS
(TO BE SUBMITTED WITH BIDS)

BIDDER'S AFFIDAVIT OF NON-COLLUSION SUBMITTED WITH BID

_____, *[Contractor]* hereby declares that:

He or she is _____ *[title/position]* of _____, *[company name]* the party making the foregoing bid; that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract or anyone interested in the proposed contract; that all statements contained in the bid are true; and, further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or date relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

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

Dated: _____ _____

Signature

Public Contract Code section 7106
Code of Civil Procedure section 2015.5

END OF BIDDER'S AFFIDAVIT OF NON-COLLUSION SUBMITTED WITH BID

BID PROPOSAL CERTIFICATE
(if Corporation)

STATE OF CALIFORNIA)
) ss:
COUNTY OF)

I HEREBY CERTIFY that a meeting of the Board of Directors of the _____ _____, a corporation existing under the laws of the State of _____, held on _____, 20____, the following resolution was duly passed and adopted:

"RESOLVED, that _____, as _____ President of the Corporation, be and is hereby authorized to execute the Bid Proposal dated _____, 20____, for the _____ _____ project, in the City of Petaluma, and that his/her execution thereof, attested by the Secretary of the Corporation, and with the Corporate Seal affixed, shall be the official act and deed of this Corporation."

I further certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the official seal of the corporation this _____, day of _____, 20____.

_____
Secretary

(SEAL)

BID PROPOSAL CERTIFICATE
(if Partnership)

STATE OF CALIFORNIA)
) ss:
COUNTY OF)

I HEREBY CERTIFY that a meeting of the Partners of the _____
_____,
a partnership existing under the laws of the State of _____, held on _____, 20____, the following resolution was duly passed and adopted:

"RESOLVED, that _____, as the General Partner of the Partnership, be and is hereby authorized to execute the Bid Proposal dated _____, 20___, for the _____ project, in the City of Petaluma and that his/her execution thereof, attested by the _____ shall be the official act and deed of this Partnership."

I further certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand this _____ day of _____, 20___.

_____
Partner

(SEAL)

BID PROPOSAL CERTIFICATE
(if Joint Venture)

STATE OF CALIFORNIA)
) ss:
COUNTY OF)

I HEREBY CERTIFY that a meeting of the Principals of the _____
_____
_____
a joint venture existing under the laws of the State of _____, held on _____, 20___, the following resolution was duly passed and adopted:

"RESOLVED, that _____, as _____ of the joint venture, be and is hereby authorized to execute the Bid Proposal dated _____, 20___, for the _____ _____ project, in the City of Petaluma, and that his/her execution thereof, attested by the _____ shall be the official act and deed of this Joint Venture."

I further certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand this _____, day of _____, 20___.

_____
Managing Partner

(SEAL)

BID PROPOSAL CERTIFICATE
(if Proprietorship)

STATE OF CALIFORNIA)
) ss:
COUNTY OF)

I HEREBY CERTIFY that _____, as owner of _____ that I am authorized to execute the Bid Proposal dated _____, 20____, for the _____ _____ project, in the City of Petaluma, and that my execution thereof shall be the official act and deed of this proprietorship.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the official seal of the corporation this _____, day of _____, 20____.

_____
Owner

(SEAL)

PROPOSAL

To the City Council of the City of Petaluma:

The undersigned declares that he/she has carefully examined the location of the proposed work, that he/she has examined the plans and specifications, and read the accompanying instructions to bidders, and hereby proposes to furnish all materials and do all the work required to complete the said work in accordance with said plans, specifications, and special provisions for the unit or lump sum prices set forth in the attached Bid Schedule.

It is understood and agreed that the undersigned shall complete the work of the contract within the time provided for in the Contract Documents and Specifications governing said work.

If awarded the contract, the undersigned hereby agrees to sign said contract and to furnish the necessary bonds, insurance certificates and agreements within five (5) working days after receipt of Notice of Award of said contract from the City.

The undersigned has examined the location of the proposed work and is familiar with the plans, specifications and other contract documents and the local conditions at the place where the work is to be done.

The undersigned has checked carefully all the figures on the attached Bid Schedule and understands that the City will not be responsible for any errors or omissions on the part of the undersigned in making up the bid.

Enclosed find bidder's bond, certified check, or cashier's check no. _____ of the _____ (Company) (Bank) for _____ Dollars ($_____).

This project requires a Class A California State Contractor's License.

Contractor's License No. _____ License Class _____

Expiration Date of Contractor's License _____

This project requires registration with the California State Department of Industrial Relations.

Public Works Contractor Registration No. _____

Registration Date _____ Expiration Date _____

A bid submitted to a public agency by a contractor who is not licensed and not registered shall be considered non-responsive and shall be rejected by the public agency. The undersigned contractor declares that the contractor's license number, public work contractor registration number, and expiration dates stated herein are made under penalty of perjury under the laws of the State of California.

Contractor: _____

Signed by: _____

Title: _____

Address: _____

_____

Phone: _____

Fax: _____

Email:_____

Dated this _____ day of _____, 20___.

END OF PROPOSAL

BID SCHEDULE

Item No.	Description	Estimated Quantity	Unit	Unit Price	Total Price
1	General Requirements	1	LS		
2	Mobilization / Demobilization	1	LS		
3	Sheeting, Shoring, and Bracing	1	LS		
4	Storm Water Pollution Prevention Plan	1	LS		
5	Demolition	1	LS		
6	Civil Work	1	LS		
7	Dewatering	1	LS		
8	AC Pavement	112,500	SF		
9	Structural Work	1	LS		
10	Chemical Storage Tanks	3	EA		
11	3" PVC Pipe Schedule 80	7,600	LF		
12	Mechanical Work	1	LS		
13	Electrical, Instrumentation and Control	1	LS		
14	Protective Coatings	1	LS		
Total Base Bid	**$**	**$**			

OPTIONAL BID ITEMS

Item No.	Description	Estimated Quantity	Unit	Unit Price	Total Price

***Note:** In case of error in extension of price into the total price column, the unit price will govern.

Total Amount of Bid (written in words) is:_____

_____ Dollars and

_____ Cents.

In the event of discrepancy between words and figures, the words shall prevail.

$_____
Figures

The award of the contract shall be awarded to the lowest price of the total of Base Bid items 1 through 10. Options Bid items should NOT be included in the Base Bid Price.

Address of Bidder	Signature of Bidder
City	Name of Bidder (Print)
Telephone Number of Bidder	Fax Number of Bidder
Contractor's License Number	License's Expiration Date

Addendum Acknowledgement

Addendum No. 1 Signature Acknowledging Receipt:_____ Date:_____

Addendum No. 2 Signature Acknowledging Receipt:_____ Date:_____

Addendum No. 3 Signature Acknowledging Receipt:_____ Date:_____

Addendum No. 4 Signature Acknowledging Receipt:_____ Date:_____

Addendum No. 5 Signature Acknowledging Receipt:_____ Date:_____

Addendum No. 6 Signature Acknowledging Receipt:_____ Date:_____

Addendum No. 7 Signature Acknowledging Receipt:_____ Date:_____

Addendum No. 8 Signature Acknowledging Receipt:_____ Date:_____

LIST OF SUBCONTRACTORS

In accordance with Section 4104 of the Public Contracting Code of the State of California, each bidder shall list below the name and location of place of business of each subcontractor who will perform a portion of the contract work in an amount in excess of one-half of one percent of the total contract price or, in the cases of bids or offers for the construction of streets or highways, including bridges, in excess of one-half of 1 percent of the prime contractor's total bid or ten thousand dollars ($10,000), whichever is greater. In each such instance, the nature and extent of the work to be performed shall be described.

If a prime contractor fails to specify a subcontractor or if a prime contractor specifies more than one subcontractor for the same portion of work to be performed under the contract in excess of one-half of one percent of the prime contractor's total bid, the prime contractor agrees that he or she is fully qualified to perform that portion himself or herself, and that the prime contractor shall perform that portion himself or herself. The subcontracting of work for which no subcontractor was designated in the original bid and which is in excess of one-half of one percent of the total contract price, will be allowed only with the written consent of the City.

Name of Subcontractor	**Address of Office, Mill, or Shop**	**Description of Work to be Performed (also show Bid Schedule Item Number)**	**Public Works Contractor Registration Number**

END OF LIST OF SUBCONTRACTORS

LIST OF MATERIAL SUPPLIERS AND MATERIAL GUARANTEE

The bidder is required to name the make and supplier of the material items listed below to be furnished under these specifications. The bidder shall name a manufacturer for each item and the supplier of the item if the supplier is not the manufacturer. The naming of more than one supplier for a single item or naming a supplier followed by the words "or equal" will not be acceptable. Substitution of any listed supplier following submission of this form with the Bid shall only be permitted as authorized by the Engineer pursuant to Section 6.3 of the General Conditions.

Failure to complete this form and submit it with the bid proposal may cause the proposal to be rejected as being incomplete and not responsive to the solicitation.

Item	**Supplier & Manufacturer**	**Address**
Chemical storage tank		
Chemical feed pump		
Chemical mixer		

MATERIAL GUARANTEE

In addition to completion of the list of material suppliers on the Material Suppliers form, the bidder may be required to furnish prior to award of contract, a complete statement of the origin, composition and manufacturer of any or all materials to be used in the construction of the work, together with samples, which samples may be subjected to test, provided for in these specifications or in the Special Provisions to determine their quality and fitness for the work.

END OF
LIST OF MATERIAL SUPPLIERS AND MATERIAL GUARANTEE

QUESTIONNAIRE AND FINANCIAL ASSURANCE STATEMENT

The following statements as to experience and financial qualifications of the Proposer are submitted in conjunction with the proposal as a part thereof, and the truthfulness and accuracy of the information is guaranteed by the Proposer.

The Proposer has been engaged in the contracting business under the present business for _____ years. Experience in work of a nature similar to that covered in the proposal extends over a period of _____ years.

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

_____

_____

_____

List all claims and lawsuits presented or filed in the last five (5) years, regardless of the form, regarding any public works project:

_____

_____

_____

The following contracts for work have been completed in the last three (3) years for the persons, firm or authority indicated and to whom reference is made:

Year	Type of Work-Size, Length and Contract Amount	Location and For Whom Performed
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

The following complaints have been made against the Proposer's contractor's license within the past ten (10) years:

Date:_____ Nature of Complaint _____

_____

_____

Reference is hereby made to the following bank or banks as to the financial responsibility of the proposer:

NAME OF BANK ADDRESS

Reference is hereby made to the following surety companies as to the financial responsibility and general reliability of the proposer:

NAME OF SURETY COMPANY:

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

SIGNATURE OF PROPOSER DATE

NAME OF PROPOSER

END OF
QUESTIONNAIRE AND FINANCIAL STATEMENT FORM

STATEMENT OF QUALIFICATIONS

The apparent low Bidder shall submit a Statement of Qualifications as specified herein as a submittal to the City within 24 hours of the bid opening.

A. The following are minimum requirements for the Bidder to be found responsible to perform the Work. Bidder's compliance with the minimum qualification requirements will be measured by the experience of the supervisory personnel who will have responsible charge of the various major components of the Work. If Bidder subcontracts portions of the Work, City, in its determination of whether the minimum qualification requirements have been met, will consider the qualifications of the Subcontractor's supervisory personnel.

1. Five years experience as a continuously operating entity engaged in the performance of similar work (similar work shall constitute wastewater treatment equipment and controls).
2. Experience on public works projects, with no history of default termination within the last ten years.
3. Within the past five years, has not filed a notice of Potential Claim pursuant to the California Public Contracts Code against the City of Petaluma, filed a claim pursuant to California Government Code against the City of Petaluma, filed a lawsuit against the City of Petaluma or reached a settlement with the City of Petaluma.
4. Within the past five years, completed two construction projects of a similar nature (wastewater treatment equipment and controls) and complexity with a contract dollar amount of at least $1,000,000 each.
5. Sufficient financial strength, stability and resources as measured by Bidder's equity, debt-to-assets ratio, and capability to finance the Work to be performed.

B. Owner will notify Apparent Low Bidder in writing of any deficiencies found and will provide Bidder the opportunity to respond in writing with reasonable clarifications but will not allow any changes in the nature of Bidder as a business entity.

SITE VISIT AFFIDAVIT
TO BE EXECUTED
BY BIDDER, NOTARIZED AND SUBMITTED WITH BID

(To Accompany Bid)

State of California)
) ss.
County of)

_____, **being first duly sworn**, deposes and says that he or
(Contractor's Authorized Representative)

she is _____of _____, the party making the foregoing
(Title of Representative) (Contractor's Name)

bid, has visited the Site of the Work as described in the Contract and has examined and familiarized themselves with the existing conditions, as well as all other conditions relating to the construction which will be performed. The submitting of a bid shall be considered an acknowledgement on the part of the Bidder of familiarity with conditions at the site of Work. The Bidder further acknowledges that the site examination has provided adequate and sufficient information related to existing conditions which may affect cost, progress or performance of the Work.

Signature Name of Bidder

BID BOND

We, _____ as Principal, and _____ as Surety, jointly and severally, bind ourselves, our heirs, representatives, successors and assigns, as set forth herein, to the City of Petaluma (herein called "the Owner") for the payment of the penal sum of _____ Dollars ($_____), lawful money of the United States, which is ten (10) percent of the total amount bid by bidder to the Owner. Principal has submitted the accompanying bid for the construction of the _____ project.

If the Principal is awarded the contract and enters into a written contract, in the form prescribed by the Owner, at the price designated by his bid, and files the bonds required by the Agreement with the Owner, and carries all insurance in type and amount which conforms to the contract documents and furnishes required certificates and endorsements thereof, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

Forfeiture of this bond, or any deposit made in lieu thereof, shall not preclude the Owner from seeking all other remedies provided by law to cover losses sustained as a result of the Principal's failure to do any of the foregoing.

Principal and Surety agree that if the Owner is required to engage the services of an attorney in connection with the enforcement of this bond, each shall pay the Owner's reasonable attorney's fees, witness fees and other costs incurred with or without suit.

Executed on _____, _____.

_____
PRINCIPAL

By_____
Signature

_____
Title

Any claims under this bond may be addressed to:

_____ (Name and address of Surety's agent for service of process in California, if different from above)

_____

_____ (Telephone number of Surety's agent in California)

_____

(Attach Acknowledgment)

_____
SURETY

By_____
(Attorney-in-Fact)

NOTICE:

No substitution or revision to this bond form will be accepted. Be sure that all bonds submitted have a certified copy of the bonding agent's power of attorney attached. Also verify that Surety is an "Admitted Surety" (i.e., qualified to do business in California), and attach proof of verification (website printout from the California Department of Insurance website (http://www.insurance.ca.gov/docs/index.html) or certificate from County Clerk).

END OF BID BOND

SECTION II

GENERAL CONDITIONS

CITY OF PETALUMA - GENERAL CONDITIONS

TABLE OF CONTENTS

ARTICLE 1 - DEFINITIONS 1
- Addenda 1
- Agreement 1
- Application for Payment 1
- Asbestos 1
- Bid 1
- Bonds 1
- Change Order 1
- CITY 1
- Clarification 1
- Contract Documents 1
- Contract Price 2
- Contract Times 2
- CONTRACTOR 2
- Day 2
- Defective Work 2
- Drawings 2
- Effective Date of the Agreement 2
- ENGINEER 2
- Field Order 2
- Hazardous Waste 2
- Laws and Regulations; Laws or Regulations 2
- Lien or Mechanic's Lien 2
- Milestone 3
- Notice of Award 3
- Notice of Completion 3
- Notice to Proceed 3
- Partial Utilization 3
- Petroleum 3
- Project 3
- Record Drawings 3
- Resident Project Representative 3
- Samples 3
- Shop Drawings 3
- Site 3
- Special Provisions 4
- Specifications 4
- Stop Notice 4
- Subcontractor 4

Supplementary General Conditions 4
Supplier 4
Utilities 4
WORK 4
Working day 4

ARTICLE 2 - PRELIMINARY MATTERS 4
2.1 DELIVERY OF BONDS AND INSURANCE CERTIFICATES 4
2.2 COPIES OF DOCUMENTS 5
2.3 COMMENCEMENT OF CONTRACT TIMES; NOTICE TO PROCEED 5
2.4 STARTING THE WORK 5
2.5 PRECONSTRUCTION CONFERENCE 5

ARTICLE 3 - INTENT AND USE OF CONTRACT DOCUMENTS 5
3.1 INTENT 5
3.2 REFERENCE TO STANDARDS 6
3.3 REVIEW OF CONTRACT DOCUMENTS 6
3.4 ORDER OF PRECEDENCE OF CONTRACT DOCUMENTS 7
3.5 AMENDING CONTRACT DOCUMENTS 7
3.6 REUSE OF DOCUMENTS 7

ARTICLE 4 - SITE OF THE WORK 8
4.1 AVAILABILITY OF LANDS 8
4.2 REPORTS OF PHYSICAL CONDITIONS 8
4.3 PHYSICAL CONDITIONS - UNDERGROUND UTILITIES 9
4.4 DIFFERING SITE CONDITIONS 9
4.5 HAZARDOUS MATERIALS 10
4.6 REFERENCE POINTS 11

ARTICLE 5 - BONDS AND INSURANCE 11
5.1 BONDS 11
5.2 INSURANCE 12

ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES 15
6.1 COMMUNICATIONS 15
6.2 SUPERVISION AND SUPERINTENDENCE 15
6.3 LABOR, MATERIALS, AND EQUIPMENT 15
6.4 SCHEDULE 20
6.5 SUBSTITUTES OR "OR EQUAL" ITEMS 20
6.6 CONCERNING SUBCONTRACTORS, SUPPLIERS, AND OTHERS 20
6.7 PERMITS 20
6.8 PATENT FEES AND ROYALTIES 20
6.9 LAWS AND REGULATIONS 21
6.10 TAXES 21
6.11 USE OF PREMISES 21
6.12 SAFETY AND PROTECTION 22

6.13 EMERGENCIES 24
6.14 SUBMITTALS 24
6.15 CONTINUING THE WORK 27
6.16 CONTRACTOR'S GENERAL WARRANTY AND GUARANTEE 27
6.17 INDEMNIFICATION 29
6.18 CONTRACTOR'S DAILY REPORTS 31
6.19 CONTRACT DOCUMENTS AND RECORD DRAWINGS 31
6.20 CLEAN UP 32
6.21 STORM WATER POLLUTION PREVENTION 33

ARTICLE 7 - OTHER WORK 39
7.1 RELATED WORK AT SITE 39
7.2 COORDINATION 40

ARTICLE 8 - CITY'S RESPONSIBILITIES 40
8.1 COMMUNICATIONS 40
8.2 PAYMENTS 40
8.3 LANDS, EASEMENTS, AND SURVEYS 40
8.4 REPORTS AND DRAWINGS 40
8.5 CHANGE ORDERS 40
8.6 INSPECTIONS AND TESTS 40
8.7 SUSPENSION OF WORK 40
8.8 TERMINATION OF AGREEMENT 41
8.9 LIMITATION ON CITY'S RESPONSIBILITIES 41
8.10 UNDISCLOSED HAZARDOUS ENVIRONMENTAL CONDITIONS 41

ARTICLE 9 - ENGINEER'S STATUS DURING CONSTRUCTION 42
9.1 CITY'S REPRESENTATIVE 42
9.2 OBSERVATIONS ON THE SITE 42
9.3 PROJECT REPRESENTATION 42
9.4 CLARIFICATIONS 42
9.5 AUTHORIZED VARIATIONS IN WORK 42
9.6 REJECTING DEFECTIVE WORK 43
9.7 CONTRACTOR SUBMITTALS, CHANGE ORDERS, AND PAYMENTS 43
9.8 DECISIONS ON DISPUTES 43
9.9 LIMITATIONS ON ENGINEER'S RESPONSIBILITIES 43

ARTICLE 10 - CHANGES IN THE WORK 44
10.1 GENERAL 44
10.2 ALLOWABLE QUANTITY VARIATIONS 45

ARTICLE 11 - CHANGE OF CONTRACT PRICE 45
11.1 GENERAL 45
11.2 COSTS RELATING TO WEATHER 46
11.3 COST OF WORK (BASED ON TIME AND MATERIALS) 46
11.4 CONTRACTOR'S OVERHEAD AND PROFIT 50

11.5 EXCLUDED COSTS 50
11.6 CONTRACTOR'S EXTRA WORK REPORT 51

ARTICLE 12 - CHANGE OF CONTRACT TIMES 52
12.1 GENERAL 52
12.2 EXTENSIONS OF CONTRACT TIMES FOR DELAY DUE TO WEATHER . 53

ARTICLE 13 - INSPECTIONS AND TESTS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK 53
13.1 NOTICE OF DEFECTIVE WORK 53
13.2 ACCESS TO WORK 53
13.3 INSPECTIONS AND TESTS 53
13.4 CITY MAY STOP THE WORK 55
13.5 CORRECTION OR REMOVAL OF DEFECTIVE WORK 55
13.6 ACCEPTANCE OF DEFECTIVE WORK 55
13.7 CITY MAY CORRECT DEFECTIVE WORK 56
13.8 CORRECTION PERIOD 56

ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION 57
14.1 SCHEDULE OF VALUES (LUMP SUM PRICE BREAKDOWN) 57
14.2 UNIT PRICE BID SCHEDULE 57
14.3 APPLICATION FOR PROGRESS PAYMENT 57
14.4 CONTRACTOR'S WARRANTY OF TITLE 58
14.5 REVIEW OF APPLICATIONS FOR PROGRESS PAYMENT 58
14.6 COMPLETION 60
14.7 PARTIAL UTILIZATION 61
14.8 FINAL APPLICATION FOR PAYMENT 61
14.9 FINAL PAYMENT AND ACCEPTANCE 61

ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION 63
15.1 SUSPENSION OF WORK BY CITY 63
15.2 TERMINATION OF AGREEMENT BY ENGINEER FOR DEFAULT 63
15.2 TERMINATION OF AGREEMENT BY CITY FOR CONVENIENCE 64
15.4 TERMINATION OF AGREEMENT BY CONTRACTOR 64

ARTICLE 16 - GENERAL TERMS 65
16.1 GIVING NOTICE 65
16.2 TITLE TO MATERIALS FOUND ON THE WORK 65
16.3 RIGHT TO AUDIT 65
16.4 SURVIVAL OF OBLIGATIONS 66
16.5 CONTROLLING LAW 66
16.6 SEVERABILITY 66
16.7 WAIVER 66

ARTICLE 17 - CALIFORNIA STATE REQUIREMENTS 67
17.1 STATE WAGE DETERMINATIONS 67

17.2 WORKERS' COMPENSATION 67
17.3 APPRENTICES ON PUBLIC WORKS 67
17.4 WORKING HOURS 68
17.5 CONTRACTOR NOT RESPONSIBLE FOR DAMAGE RESULTING FROM CERTAIN ACTS OF GOD 68
17.6 NOTICE OF COMPLETION 68
17.7 UNPAID CLAIMS 68
17.8 RETAINAGE FROM MONTHLY PAYMENTS 69
17.9 PUBLIC WORKS CONTRACTS; ASSIGNMENT TO AWARDING BODY 69
17.10 PAYROLL RECORDS; RETENTION; INSPECTION, NONCOMPLIANCE PENALTIES; RULES AND REGULATIONS 70
17.11 CULTURAL RESOURCES 71
17.12 PROTECTION OF WORKERS IN TRENCH EXCAVATIONS 71
17.13 CONCRETE FORMS, FALSEWORK, AND SHORING 72
17.14 REMOVAL, RELOCATION, OR PROTECTION OF EXISTING UTILITIES 72
17.15 CONTRACTOR LICENSE REQUIREMENTS 73
17.16 DIGGING TRENCHES OR EXCAVATIONS; NOTICE ON DISCOVERY OF HAZARDOUS WASTE OR OTHER UNUSUAL CONDITIONS; INVESTIGATIONS; CHANGE ORDERS' EFFECT ON CONTRACT 74
17.17 RETENTION PROCEEDS; WITHHOLDING; DISBURSEMENT 75
17.18 TIMELY PROGRESS PAYMENTS; INTEREST; PAYMENT REQUESTS 77
17.19 PREFERENCE FOR MATERIAL 77
17.20 RESOLUTION OF CONSTRUCTION CLAIMS 78

ARTICLE 1 - DEFINITIONS

Whenever used in these General Conditions or in the other Contract Documents, the following terms have the meanings indicated in this Article 1 which meanings are applicable to both the singular and plural thereof. If a word which is entirely in upper case in these definitions is found in lower case in the Contract Documents, then the lower case word will have its ordinary meaning.

Addenda - Written or graphic instruments issued prior to the opening of Bids which make additions, deletions, or revisions to the Contract Documents.

Agreement - The written contract between the CITY and the CONTRACTOR covering the WORK to be performed; other documents are attached to the Agreement and made a part thereof as provided therein.

Application for Payment - The form accepted by the ENGINEER which is to be used by the CONTRACTOR to request progress payments or final payment and which is to be accompanied by such supporting documentations as is required by the Contract Documents.

Asbestos - Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

Bid - The offer or proposal of the bidder submitted on the prescribed form setting forth the price or prices for the WORK.

Bonds - Bid, Performance, and Labor and Materials, and Maintenance Bonds and other instruments of security.

Change Order - A document recommended by the ENGINEER, which is signed by the CONTRACTOR and the CITY, and authorizes an addition, deletion, or revision in the WORK, or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

CITY - The City of Petaluma.

Clarification - A document issued by the ENGINEER to the CONTRACTOR that clarifies the requirements(s) and/or design intent of the Contract Documents, which may not represent an addition, deletion, or revision in the WORK or an adjustment in the Contract Price or the Contract Times.

Contract Documents - The Notice Inviting Bids, Instructions to Bidders, Bid Forms (including the Bid, Bid Schedule(s), Information Required of Bidder, Bid Bond, and all required certificates, affidavits and other documentation), Agreement, Performance Bond, Labor and Materials Bond, Maintenance Bond, General Conditions, any Supplementary General Conditions, Special

Provisions, Specifications, Drawings, all Addenda, and Change Orders executed pursuant to the provisions of the Contract Documents. Shop Drawings are not Contract Documents.

Contract Price - The total monies payable by the CITY to the CONTRACTOR under the terms and conditions of the Contract Documents.

Contract Times - The number or numbers of successive calendar days or dates stated in the Contract Documents for the completion of the WORK.

CONTRACTOR - The individual, partnership, corporation, joint-venture, or other legal entity with whom the CITY has executed the Agreement.

Day - A calendar day of 24 hours measured from midnight to the next midnight.

Defective Work - Work that is unsatisfactory, faulty, or deficient; or that does not conform to the Contract Documents; or that does not meet the requirements of any inspection, reference standard, test, or approval referred to in the Contract Documents; or work that has been damaged prior to the ENGINEER's recommendation of final payment.

Drawings - The drawings, plans, maps, profiles, diagrams, and other graphic representations which indicate the character, location, nature, extent, and scope of the WORK and which have been prepared by the ENGINEER and are included and/or referred to in the Contract Documents. Shop Drawings are not Drawings as so defined.

Effective Date of the Agreement - The date indicated in the Agreement on which it becomes effective, but if no such date is indicated it means the date which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

ENGINEER - The City Manager or his/her designee.

Field Order - A written order issued by the ENGINEER which may or may not involve a change in the WORK.

Hazardous Waste - The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 U.S.C. Section 6906) as amended from time to time.

Laws and Regulations; Laws or Regulations - Any and all applicable laws, rules, regulations, ordinances, codes, and/or orders of any and all governmental bodies, agencies, authorities and courts having jurisdiction.

Lien or Mechanic's Lien - A form of security, an interest in real property, which is held to secure the payment of an obligation. When related to public works construction, Lien or Mechanic's Lien may be called Stop Notice.

Milestone - A principal event specified in the Contract Documents relating to an intermediate completion date of a separately identifiable part of the WORK or a period of time within which

the separately identifiable part of the WORK should be performed prior to completion of all the WORK.

Notice of Award - The written notice by the CITY to the apparent successful bidder stating that upon compliance by the apparent successful bidder with the conditions precedent enumerated therein within the time specified, the CITY will enter into an Agreement.

Notice of Completion - A form signed by the ENGINEER and the CONTRACTOR recommending to the CITY that the WORK is Complete and fixing the date of completion. After acceptance of the WORK by the CITY Council, the form is signed by the CITY and filed with the County Recorder. This filing starts the 30 day lien filing period on the WORK.

Notice to Proceed - The written notice issued by the CITY to the CONTRACTOR authorizing the CONTRACTOR to proceed with the WORK for the purpose for which it is intended prior to completion of all the WORK.

Partial Utilization - Use by the CITY of a completed part of the WORK for the purpose for which it is intended prior to completion of all the WORK.

Petroleum - Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Wastes and crude oils.

Project - The total construction project of which the WORK to be provided under the Contract Documents may be the whole, or as part as indicated elsewhere in the Contract Documents.

Record Drawings - Drawings generated by marking a set of Drawings to reflect all of the changes that have occurred during construction of the Project.

Resident Project Representative - The authorized representative of the ENGINEER who is assigned to the Site or any part thereof.

Samples - Physical examples of materials, equipment, or workmanship that are representative of some portion of the WORK and which establish the standards by which such portion of the WORK will be judged.

Shop Drawings - All drawings, diagrams, illustrations, schedules, and other data which are specifically prepared by or for the CONTRACTOR and submitted by the CONTRACTOR to illustrate some portion of WORK.

Site - Lands or other areas designated in the Contract Documents as being furnished by the CITY for the performance of the construction, storage, or access.

Special Provisions - Specific clauses setting forth conditions or requirements peculiar to the work and supplementary to the Standard Specifications.

Specifications - The directions, provisions and requirements set forth in the Standard Specifications as supplemental and modified by the special provisions.

Stop Notice - A legal remedy for subcontractors and suppliers who contribute to public works, but who are not paid for their work, which secures payment from construction funds possessed by the CITY. In some states, for public property, the Stop Notice remedy is designed to substitute for a mechanic's lien.

Subcontractor - An individual, partnership, corporation, joint-venture, or other legal entity having a direct contract with the CONTRACTOR or with any other subcontractor for the performance of a part of the WORK at the Site.

Supplementary General Conditions - The part of the Contract Documents which make additions, deletions, or revisions to these General Conditions.

Supplier - A manufacturer, fabricator, distributor, materialman, or vendor having a direct contract with the CONTRACTOR or with any Subcontractor to furnish materials, equipment, or product to be incorporated in the WORK by the CONTRACTOR or any Subcontractor.

Utilities - All pipelines, conduits, ducts, cables, wires, tracks, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities which have been installed underground or above the ground to furnish any of the following services or materials; water, sewage, sludge, drainage, fluids, electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, traffic control, or other control systems.

WORK - The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. WORK is the result of performing or furnishing labor and furnishing and incorporating materials and equipment into the construction, and performing or furnishing services and furnishing documents, all as required by the Contract Documents.

Working day - Any day except Saturdays, Sundays and CITY holidays.

ARTICLE 2 – PRELIMINARY MATTERS

2.1 DELIVERY OF BONDS AND INSURANCE CERTIFICATES

A. When the CONTRACTOR delivers the signed Agreement to the CITY, the CONTRACTOR shall also deliver to the CITY such Bonds and insurance policies and certificates as the CONTRACTOR may be required to furnish in accordance with the Contract Documents.

2.2 COPIES OF DOCUMENTS

A. The CITY will furnish to the CONTRACTOR the required number of copies of the Contract Documents specified in the Supplementary General Conditions.

2.3 COMMENCEMENT OF CONTRACT TIMES; NOTICE TO PROCEED

A. The Contract Times will start to run on the commencement date stated in the Notice to Proceed.

2.4 STARTING THE WORK

A. The CONTRACTOR shall begin to perform the WORK on the commencement date stated in the Notice to Proceed, but no work shall be done at the Site prior to said commencement date.

B. Before undertaking each part of the WORK, the CONTRACTOR shall review the Contract Documents in accordance with Paragraph 3.3.

2.5 PRECONSTRUCTION CONFERENCE

A. The CONTRACTOR is required to attend a preconstruction conference. This conference will be attended by the CITY, ENGINEER, and others as appropriate in order to discuss the WORK.

B. The CONTRACTOR's initial schedule submittals for shop drawings, obtaining permits, and Plan of Operation and CPM Schedule will be reviewed and finalized. At a minimum, the CONTRACTOR's representatives shall include its project manager, project superintendent and schedule expert. If the submittals are not finalized at the end of the meeting, additional meetings will be held so that the submittals can be finalized prior to the submittal of the first Application for Payment. No Application for Payment will be processed prior to receiving acceptable initial submittals from the CONTRACTOR.

ARTICLE 3 – INTENT AND USE OF CONTRACT DOCUMENTS

3.1 INTENT

A. The Contract Documents comprise the entire agreement between the CITY and the CONTRACTOR concerning the WORK. The Contract Documents are complementary; what is called for by one is as binding as if called for by all. The Contract Documents will be construed in accordance with the law of the State of California .

B. It is the intent of the Contract Documents to describe the WORK, functionally complete, to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as

being required to produce the intended result will be provided whether or not called for specifically.

C. When words or phrases which have a well-known technical or construction industry or trade meaning are used to describe work, materials, or equipment such words or phrases shall be interpreted in accordance with that meaning unless a definition has been provided in Article 1 of the General Conditions.

3.2 REFERENCE TO STANDARDS

A. Reference to standard specifications, manuals, or codes of any technical society, organization, or association, or to the Laws or Regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids, except as may be otherwise specifically stated. However, no provision of any referenced standard specification, manual or code shall be effective to change the duties and responsibilities of the CITY or the CONTRACTOR or any of their consultants, agents or employees, from those set forth in the CONTRACT Documents, nor shall it be effective to assign to CITY any duty or authority to direct the performance of the WORK or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.3 REVIEW OF CONTRACT DOCUMENTS

A. If, during the performance of the WORK, CONTRACTOR discovers any conflict, error, ambiguity or discrepancy within the Contract Documents or between the Contract Documents and any provision of any such Law or Regulation applicable to the performance of the WORK or of any such standard, specification, manual, or code, or of any instruction of any Supplier, CONTRACTOR shall report it to ENGINEER in writing at once, and CONTRACTOR shall not proceed with the work affected thereby (except in an emergency as authorized by Paragraph 6.13 until a Clarification, Field Order, or Change Order to the Contract Documents has been issued.

3.4 ORDER OF PRECEDENCE OF CONTRACT DOCUMENTS

A. Unless otherwise noted herein, conflicts or inconsistencies between parts of the Contract will be resolved by the ENGINEER with a Change Order or an Addendum, if required. Addenda and Change Orders bearing the most recent date shall prevail over Addenda or Change Orders bearing earlier dates. Any reference to addenda-changed specifications or drawings shall be considered to have been changed accordingly. In resolving conflicts resulting from errors or discrepancies in any of the Contract Documents, the order of precedence shall be as follows:

1. Change Orders/Addenda (most recent in time take precedence)
2. Agreement and Bond Forms
3. Referenced Standard Specifications
4. Special Provisions
5. Drawings
6. General Conditions
7. Instructions to Bidders
8. Contractor's Bid (Bid Form)
9. Notice Inviting Bids
10. Supplementary General Conditions (if any)
11. Permits from other agencies as may be required by law

B. With reference to the Drawings the order of precedence is as follows:

1. Figures govern over scaled dimensions
2. Detail drawings govern over general drawings
3. Addenda/Change Order drawings govern over any other drawings
4. Drawings govern over standard drawings

3.5 AMENDING CONTRACT DOCUMENTS

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the WORK or to modify the terms and conditions thereof by a Change Order (pursuant to Article 10).

3.6 REUSE OF DOCUMENTS

A. Neither the CONTRACTOR, nor any Subcontractor or Supplier, nor any other person or organization performing any of the WORK under a contract with the CITY shall have or acquire any title to or ownership rights in any of the Drawings, Technical Specifications, or other documents used on the WORK, and they shall no reuse any of them on the extensions of the Project or any other project without written consent of CITY.

ARTICLE 4 – SITE OF THE WORK

4.1 AVAILABILITY OF LANDS

A. The CITY will furnish, as indicated in the Contract Documents, the lands upon which the WORK is to be performed, rights-of-way and easements for access thereto, and such other lands which are designated for the use of the CONTRACTOR. Easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by the CITY, unless otherwise provided in the Contract Documents. Nothing contained in the Contract Documents shall be interpreted as giving the CONTRACTOR exclusive occupancy of the lands or rights-of-way provided. The CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment; provided, that the CONTRACTOR shall not enter upon nor use any property not under the control of the CITY until a written temporary construction easement agreement has been executed by the CONTRACTOR and the property owner, and a copy of said easement furnished to the ENGINEER prior to said use; and the CITY will not be liable for any claims or damages resulting from the CONTRACTOR's trespass on or use of any such properties. The CONTRACTOR shall provide the CITY with a signed release from the property owner confirming that the lands have been satisfactorily restored upon completion of the WORK.

4.2 REPORTS OF PHYSICAL CONDITIONS

A. **Subsurface Explorations**: Reference is made to any Supplementary General Conditions for identification of those reports of explorations and tests of subsurface conditions at the Site that have been utilized by the ENGINEER in the preparation of the Contract Documents.

B. **Existing Structures**: Reference is made to any Supplementary General Conditions for identification of those drawings of physical conditions in or relating to existing surface and subsurface structures (except underground Utilities referred to in Paragraph 4.3 herein) which are at or contiguous to the Site that have been utilized in the preparation of the Contract Documents.

C. The CITY makes no representation as to the completeness of the reports or drawings referred to in Paragraph 4.2 A or B above or the accuracy of any data or information contained therein. The CONTRACTOR may rely upon the accuracy of the technical data contained in such reports and drawings. However, the CONTRACTOR may not rely upon any interpretation of such technical data, including any interpolation or extrapolation thereof, or any non-technical data, interpretations, and opinions contained therein.

4.3 PHYSICAL CONDITIONS - UNDERGROUND UTILITIES

A. **Indicated**: The information and data indicated in the Contract Documents with respect to existing underground Utilities at or contiguous to the Site are based on information and data furnished to the CITY or the ENGINEER by the owners of such underground Utilities or by others. Unless it is expressly provided in any Supplementary General Conditions the CITY will not be responsible for the accuracy or completeness of any such information or data, and the CONTRACTOR shall have full responsibility for reviewing and checking all such information and data, for locating all underground Utilities indicated in the Contract Documents, for coordination of the WORK with the owners of such underground Utilities during construction, for the safety and protection thereof and repairing any damage thereto resulting from the WORK, the cost of all of which are deemed to have been included in the Contract Price.

B. **Not Indicated**: If an underground Utility is uncovered or revealed at or contiguous to the Site which was not indicated in the Contract Documents and which the CONTRACTOR could not reasonably have been expected to be aware of, the CONTRACTOR shall identify the owner of such underground Utility and give written notice thereof to that owner and shall notify the ENGINEER.

4.4 DIFFERING SITE CONDITIONS

A. The CONTRACTOR shall notify the ENGINEER, in writing, of the following unforeseen conditions, hereinafter called differing Site conditions, promptly upon their discovery (but in no event later than 14 days after their discovery) and before they are disturbed:

1. Subsurface or latent physical conditions at the Site of the WORK differing materially from those indicated, described, or delineated in the Contract Documents, including those reports discussed in Paragraph 4.2, 4.3, and 4.5.

B. The ENGINEER will review the pertinent conditions, determine the necessity of obtaining additional explorations or tests with respect thereto.

C. If the ENGINEER concludes that because of newly discovered conditions a change in the Contract Documents is required, a Change Order will be issued as provided in Article 10 to reflect and document the consequences of the difference.

D. In each such case, an increase or decrease in the Contract Price or an extension or shortening the Contract Times, or any combination thereof, will be allowable to the extent that they are attributable to any such difference. If the ENGINEER and the CONTRACTOR are unable to agree as to the amount or length thereof, a claim may be made therefor as provided in Articles 11 and 12.

E. The CONTRACTOR's failure to give notice of differing Site conditions within 14 days of their discovery and before they are disturbed shall constitute a waiver of all claims in connection therewith, whether direct or consequential in nature.

4.5 HAZARDOUS MATERIALS

A. CITY shall be responsible for any Asbestos, Hazardous Waste, Petroleum, or Radioactive Material uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the WORK and which may present a substantial danger to persons or property exposed thereto in connection with the WORK at the Site. CITY will not be responsible for any such material brought to the Site by CONTRACTOR, Subcontractors, Suppliers, or anyone else for whom CONTRACTOR is responsible.

1. Upon discovery of any Asbestos, Hazardous Waste, Petroleum, or Radioactive Material, the CONTRACTOR shall immediately stop all work in any area affected thereby (except in an emergency as required by Paragraph 6.13) and notify ENGINEER (and therefore confirm such notice in writing). CONTRACTOR shall not be required to resume any work in any such affected area until after CITY has obtained any required permits related thereto and delivered to CONTRACTOR special written notice. Such written notice will specify that such condition and any affected area is or has been rendered safe for the resumption of the work or specify any special conditions under which the work may be resumed safely. If ENGINEER and CONTRACTOR cannot agree as to entitlement to or the amount or extent of adjustment, if any, in Contract Price or Contract Times as a result of such work stoppage or such special conditions under which work is agreed by CONTRACTOR to be resumed, either party may make a claim therefor as provided in Articles 11 and 12.

2. If, after receipt of such special written notice, CONTRACTOR does not agree to resume such WORK based on a reasonable belief it is unsafe, or does not agree to resume such WORK under special conditions, ENGINEER may order such portion of the WORK that is in connection with such hazardous condition or in such affected area to be deleted from the WORK. If ENGINEER and CONTRACTOR cannot agree as to entitlement to or the amount or extent of an adjustment, if any, in Contract Price or Contract Times as a result of deleting such portion of the WORK then either party may make a claim therefor as provided in Articles 11 and 12. CITY may have such deleted portion of the WORK performed by CITY's own forces or others in accordance with Article 7.

B. The provisions of Paragraphs 4.2, 4.3, and 4.4 are not intended to apply to Asbestos, Petroleum, Hazardous Waste, or Radioactive Material uncovered or revealed at the Site.

4.6 REFERENCE POINTS

A. The ENGINEER will provide the location and elevation of one bench mark, near or on the Site of the WORK, for use by the CONTRACTOR for alignment and elevation control. Unless otherwise specified in any Supplementary General Conditions, the CONTRACTOR shall furnish all other lines, grades, and bench marks required for proper execution of the WORK.

B. The CONTRACTOR shall preserve or replace any and all bench marks, section corners, witness corners, stakes, and other survey marks, and in case of their removal or destruction by any party, the CONTRACTOR shall be responsible for the accurate replacement of such reference points by surveyor licensed under the applicable state codes governing land surveyors.

ARTICLE 5 – BONDS AND INSURANCE

5.1 BONDS

A. The CONTRACTOR shall furnish Performance and Labor and Materials Bonds, each in the amount of one hundred percent (100%) of the contract price, as security for the faithful performance and payment of all the CONTRACTOR's obligations under the Contract Documents. These Bonds shall remain in effect at least until one year after the date of completion, except as otherwise provided by Law or Regulation or by the Contract Documents. The CONTRACTOR shall also furnish such other Bonds as are required by the Supplementary General Conditions.

B. The CONTRACTOR shall guarantee the WORK to be free of defects in material and workmanship for a period of one (1) year following the CITY's acceptance of the WORK. The CONTRACTOR shall agree to make, at the CONTRACTOR's own expense, any repairs or replacements made necessary by defects in material or workmanship which become evident within the one-year guarantee period. The CONTRACTOR's guarantee against defects required by this provision shall be secured by a Maintenance Bond, in the amount of ten percent (10%) of the contract price, which shall be delivered by the CONTRACTOR to the CITY prior to acceptance of the WORK. The Maintenance Bond shall remain in force for one (1) year from the date of acceptance of the contracted WORK. The CONTRACTOR shall make all repairs and replacements within the time required during the guarantee period upon receipt of written order from the ENGINEER. If the CONTRACTOR fails to make the repairs and replacements within the required time, the CITY may do the work and the CONTRACTOR and the CONTRACTOR's surety for the Maintenance Bond shall be liable to the CITY for the cost. The expiration of the Maintenance Bond during the one-year guarantee period does not operate to waive or void the one-year guarantee, as set forth herein and in paragraph 6.16 of these General Conditions.

C. All Bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff, Bureau of Government Financial Operations, U.S. Treasury Department. All Bonds signed by an agent must be accompanied by a certified copy of such agent's authority to act.

D. If the surety on any Bond furnished by the CONTRACTOR is declared a bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the WORK is located, the CONTRACTOR shall within 7 days thereafter substitute another Bond and surety, which must be acceptable to the CITY.

E. All Bonds required by the Contract Documents to be purchased and maintained by CONTRACTOR shall be obtained from surety companies that are duly licensed or authorized in the State of California to issue Bonds for the limits so required. Such surety companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary General Conditions.

5.2 INSURANCE

Contractor and any subcontractor shall not commence work under this Agreement until Contractor shall have obtained all insurance required under this paragraph and such insurance shall have been approved by the City Attorney as to form and carrier and the City Manager as to sufficiency, nor shall Contractor allow any contractor or subcontractor to commence work on this contract or subcontract until all similar insurance required of the contractor and/or subcontractor shall have been so obtained and approved. All requirements herein provided shall appear either in the body of the insurance policies or as endorsements and shall specifically bind the insurance carrier.

CONTRACTOR shall procure and maintain for the duration of the contract all necessary insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the work hereunder by the Contractor, the Contractor's agents, representatives, employees or subcontractors.

A. **Minimum Scope of Insurance**

Coverage shall be at least as broad as:

1. Insurance Services Office Commercial General Liability coverage.

2. Insurance Services Office form number CA covering Automobile Liability, code 1 (any auto).

3. Workers' Compensation insurance as required by the State of California and Employer's Liability Insurance.

4. [Optional] Such other insurance coverages and limits as may be required by the CITY as follows: _____.

B. **Minimum Limits of Insurance**

CONTRACTOR shall maintain limits no less than:

1. General Liability: $2,000,000 per occurrence for bodily injury, personal injury and property damage. If Commercial General Liability Insurance or other form with a general aggregate liability is used, either the general aggregate limit shall apply separately to this project/location or the general aggregate limit shall be twice the required occurrence limit.

2. Automobile Liability: $1,000,000 per accident for bodily injury and property damage.

3. Employer's Liability: Bodily Injury by Accident - $1,000,000 each accident
   Bodily Injury by Disease - $1,000,000 policy limit
   Bodily Injury by Disease - $1,000,000 each employee

C. **Deductibles and Self-Insured Retentions**

Any deductibles or self-insured retentions must be declared to and approved by the CITY. At the option of the CITY, either: the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects the CITY, its officers, officials, employees, and volunteers; or the CONTRACTOR shall procure a bond guaranteeing payment of losses and related investigations, claim administration and defense expenses.

D. **Other Insurance Provisions**

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

1. The CITY, its officers, officials, employees, agents and volunteers are to be covered as insureds as respects: liability arising out of activities performed by or on behalf of the CONTRACTOR; products and completed operations of the CONTRACTOR; premises owned, occupied or used by the CONTRACTOR; or automobiles owned, leased, hired or borrowed by the CONTRACTOR. The coverage shall contain no special limitations on the scope of protection afforded to the CITY, its officers, officials, employees, agents or volunteers.

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

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

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

5. Each insurance policy required by this clause shall be endorsed to state that coverage shall not be suspended, voided, canceled by either party, reduced in coverage or in limits except after thirty (30) days' prior written notice by certified mail, return receipt requested, has been given to the CITY.

E. **Acceptability of Insurers**

Insurance is to be placed with insurers with a current A.M. Best's ration of no less than A:VII.

F. **Verification of Coverage**

CONTRACTOR shall furnish the CITY with original endorsements effecting coverage required by this clause. The endorsements are to be signed by a person authorized by that insurer to bind coverage on its behalf. The endorsements are to be on forms provided by the CITY. All endorsements are to be received and approved by the CITY before work commences. As an alternative to the CITY's

forms, the CONTRACTOR's insurer may provide complete, certified copies of all required insurance policies, including endorsements effecting the coverage required by these specifications.

ARTICLE 6 – CONTRACTOR'S RESPONSIBILITIES

6.1 COMMUNICATIONS

A. Written communications with the CITY shall be only through or as directed by the ENGINEER.

6.2 SUPERVISION AND SUPERINTENDENCE

A. The CONTRACTOR shall supervise, inspect, and direct the WORK competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the WORK in accordance with the Contract Documents. The CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction and all safety precautions and programs incidental thereto. The CONTRACTOR shall be responsible to see that the completed WORK complies accurately with the Contract Documents.

B. The CONTRACTOR shall designate in writing and keep on the Site at all times during the performance of the WORK a technically qualified, English-speaking superintendent, who is an employee of the CONTRACTOR and who shall not be replaced without written notice to the ENGINEER. The superintendent will be the CONTRACTOR's representative at the Site and shall have authority to act on behalf of the CONTRACTOR. All communications given to the superintendent shall be as binding as if given to the CONTRACTOR.

C. The CONTRACTOR's superintendent shall be present at the Site at all times while work is in progress and shall be available by phone for emergencies 24 hours per day, 7 days per week. Failure to observe this requirement shall be considered suspension of the WORK by the CONTRACTOR until such time as such superintendent is again present at the Site.

6.3 LABOR, MATERIALS, AND EQUIPMENT

A. The CONTRACTOR shall provide competent, suitably qualified personnel to survey and lay out the WORK and perform construction as required by the Contract Documents. The CONTRACTOR shall furnish, erect, maintain, and remove the construction plant and any required temporary works. The CONTRACTOR shall at all times maintain good discipline and order at the Site. Except in connection with the safety or protection of persons or the WORK or property at the Site or adjacent thereto, and except as otherwise indicated in the Contract Documents, all work at the Site shall be performed during regular working hours, and the

CONTRACTOR will not permit overtime work or the performance of work on Saturday, Sunday, or any federally observed holiday without the CITY's written consent. The CONTRACTOR shall apply for this consent through the ENGINEER in writing a minimum of 24 hours in advance.

B. Except as otherwise provided in this Paragraph, the CONTRACTOR shall receive no additional compensation for overtime work, i.e., work in excess of 8 hours in any one calendar day or hours in any one calendar week, even though such overtime work may be required under emergency conditions and may be ordered by the ENGINEER in writing. Additional compensation will be paid to the CONTRACTOR for overtime work only in the event extra work is ordered by the ENGINEER and the Change Order specifically authorizes the use of overtime work and then only to such extent as overtime wages are regularly being paid by the CONTRACTOR for overtime work of a similar nature in the same locality.

C. All increased costs of inspection and testing performed during overtime work by the CONTRACTOR which is allowed solely for the convenience of the CONTRACTOR shall be borne by the CONTRACTOR. The CITY has the authority to deduct the cost of all such inspection and testing from any partial payments otherwise due to the CONTRACTOR.

D. Unless otherwise specified in the Contract Documents, the CONTRACTOR shall furnish and assume full responsibility for all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, lubricants, power, light, heat, telephone, water, sanitary facilities, and all other facilities, consumables, and incidentals necessary for the furnishing, performance, testing, start-up, and completion of the WORK.

E. All materials and equipment incorporated into the WORK shall be of specified quality and new, except as otherwise provided in the Contract Documents. All warranties and guarantees specifically called for by the Specifications shall expressly run to the benefit of the CITY. If required by the ENGINEER, the CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the source, kind and quality of materials and equipment. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with the instructions of the applicable Supplier except as otherwise provided in the Contract Documents; but no provisions of any such instructions will be effective to assign to the CITY or any of its consultants, agents, or employees, any duty or authority to supervise or direct the furnishing or performance of the WORK or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.9 C.

F. The work, unless otherwise permitted or approved by the ENGINEER, shall be completed with the incorporated use of equipment, materials, and/or products where such are specified. Substitutions and equal alternatives will be permitted as provided in this article; however, neither the request for substitution nor the offer

of alternatives shall in any way by their submittal obligate the CITY to assent to any request or offer. Failure of the CONTRACTOR awarded the work to either submit requests for substitutions or to offer alternatives within the required times provided in this General Condition will be considered as evidence that the work shall be accomplished with trade-named equipment, materials, and/or products as identified in the Specifications and/or the Drawings.

G. Unless otherwise provided elsewhere in the Contract, all equipment, materials, and/or products incorporated into the work shall be new and, where not specified, shall be of the highest quality of the respective kinds for the intended use, and all workmanship shall meet or exceed applicable construction industry standards and practices. If equipment, materials, and/or products are designated by listing named manufacturers of particular equipment, materials, and/or products followed by the words "or equal," then the CONTRACTOR may furnish the named equipment, materials, and/or products or any equal equipment, materials, and/or products. The first-named manufacturer of particular equipment, materials, and/or products is the basis for the design shown on the Project Drawings. A subsequently named manufacturer or particular equipment, materials, and/or products has been determined to be an acceptable substitution but may require modifications in the Project's design and its ultimate construction to accommodate its use. If such subsequently named items are selected by the CONTRACTOR for incorporation into the work, the CONTRACTOR shall assume all costs required for modifications to the equipment, materials, and/or products, and Project design and construction as may be required for said items' use. Substitutions for an unnamed "equal" item of material shall be permitted upon compliance of the procedures set forth in Paragraph I of this article. If a CONTRACTOR makes use of an unnamed "equal" product as a substitute for a specifically named material or product, the CONTRACTOR shall assume all costs required to make the necessary revisions or modifications to accommodate the use of said unnamed product.

H. Before beginning the work and within thirty-five (35) calendar days after award of the Contract, the CONTRACTOR shall submit a List of Materials to the ENGINEER for review. The List shall include all items of equipment, materials, and/or products to be incorporated into the work and the names of suppliers with whom purchase orders have been placed. The names on the List shall be arranged in the same order as in the specifications, and shall contain sufficient data to identify precisely the items of equipment, materials, and/or products the CONTRACTOR proposes to furnish. The List shall include Specifications or Drawing references. Once the submission is determined to be acceptable to the ENGINEER, it shall be returned to the CONTRACTOR.

I. Substitution for those equipment, materials, and/or products specified shall only be permitted when the proposed unnamed "equal" product or material to be furnished is both equal in quality and utility and after the CONTRACTOR has complied with the following provisions: (1) All substitutions shall be reviewed by the ENGINEER. (2) The ENGINEER must approve such substitution in writing prior

to its incorporation into the work. (3) Unless otherwise authorized in writing by the CITY, the CONTRACTOR shall, within thirty-five (35) calendar days of award and prior to placing any purchase orders, but at least thirty (30) calendar days before it requires approval of any such alternative item, submit to the CITY sufficient data, drawings, samples, literature, or other detailed information as will demonstrate to the ENGINEER that the proposed substitute is equal in quality and utility to the equipment, materials and/or products specified.

1. Within thirty (30) calendar days following receipt of all requested information from the CONTRACTOR, the ENGINEER will determine whether the proposed alternative is equal in quality and utility and meets the requirements of the Contract and will inform the CONTRACTOR in writing of such determination. The burden of substantiating the quality and utility of alternatives shall be upon the CONTRACTOR, and the CONTRACTOR shall furnish all necessary information requested and required by the ENGINEER. The ENGINEER will be the sole judge as to the quality and utility of alternative equipment, materials, and/or products, and the ENGINEER's decision shall be final. An acceptance by the ENGINEER of a substitution shall not relieve the CONTRACTOR from complying with the requirements of the Drawings and Specifications. Acceptance by the ENGINEER shall not relieve the CONTRACTOR from full responsibility for the efficiency, sufficiency, and quality and performance of the substitute equipment, materials, and/or products, in the same manner and degree as the equipment, materials, and/or products specified by name.

2. Failure of the CONTRACTOR to submit proposed substitutions for review in the manner described above and within the time prescribed shall be sufficient cause for rejection by the CITY of any other proposed substitutions.

3. In determining whether a proposed product is equal in quality and utility, the ENGINEER is not restricted to such basic issues as performance and durability, but may consider any other issues that the ENGINEER, in the discretion of the ENGINEER, deems appropriate. Said issues may, but are not required to include, nor are they limited to, such additional factors as comparable performance, reliability, efficiency of operation, ease of operation, adaptability, ease of maintenance, capital costs, life-cycle costs, operational characteristics, costs of training personnel, maintenance history, warranties, problems created by the resulting overall warranty system, availability of qualified service, availability of parts, the history of any supplier and compatibility with existing facilities.

4. No one factor or group of factors, including such issues as savings on capital costs, shall be determinative of whether the proposed product or material is equal in quality and utility. The decision of the ENGINEER shall be based

on those factors deemed by the ENGINEER to be relevant and any data, drawings, samples, literature, or other detailed information furnished by the CONTRACTOR with respect to the proposed substitution. Each decision as to whether a product or material is equal in quality and utility shall be made by the ENGINEER on a case-by-case basis.

5. The CONTRACTOR shall be responsible for any and all costs, including consultant costs, incurred by the CITY with respect to the proposed substitution that exceed the costs inherent in the normal and reasonable review of drawings and other standard data, information, and documents concerning any proposed substitution. The CONTRACTOR shall be responsible for this cost, regardless of whether or not the substitution is approved by the ENGINEER.

J. Unless otherwise provided in the Contract, the title and interest in the right to the use of all water, and the title to all soil, stone, gravel, sand, minerals, timber, and all other materials developed or obtained within the Project limits from operations by the CONTRACTOR or any of its subcontractors, of any of their representatives or employees, and the right to use or dispose of the same are hereby expressly reserved in the CITY; and neither the CONTRACTOR nor any of its subcontractors, nor any of their representatives or employees, shall have any right, title, or interest in or to any part thereof.

K. All material used under the Contract after it has been attached or affixed to the work or soil and after partial payment has been made therefore shall become the property of the CITY.

L In the event that any Indian relics or items possessing archaeological or historical value are discovered by the CONTRACTOR or any of its subcontractors or any of their representatives or employees, the CONTRACTOR shall immediately notify the ENGINEER and await the ENGINEER's decision before proceeding with any work. The CONTRACTOR shall have no property right in such relics and items.

M. The CONTRACTOR shall be satisfied as to the quantity of acceptable materials or products which may be produced or obtained at local sources, and the CITY will not assume any responsibility as to the quantities or quality of acceptable materials or products available.

N. The CONTRACTOR, with the permission of the ENGINEER, may use in the proposed construction such stone, gravel, sand, or other material suitable in the opinion of the ENGINEER as may be found in excavation.

O. Existing equipment, materials, and/or products to be salvaged shall remain the property of the CITY. Salvage to be reinstalled in the work shall be refurbished as required before reinstallation. Other work to be salvaged shall be carefully removed

and handled in such a manner as to avoid damage and shall be delivered to storage at a location designated by the ENGINEER.

6.4 SCHEDULE

A. The CONTRACTOR shall comply with the schedule requirements in the Special Provisions or as otherwise provided in the Contract Documents.

6.5 SUBSTITUTES OR "OR EQUAL" ITEMS

A. The CONTRACTOR shall submit proposed substitutes or "or equal" items in accordance with the Bidding Requirements. No request for substitution of an "or equal" item will be considered by the ENGINEER after award of the Contract, except as provided in Paragraph 6.3I herein.

6.6 CONCERNING SUBCONTRACTORS, SUPPLIERS, AND OTHERS

A. The CONTRACTOR shall be responsible to the CITY for the acts and omissions of its Subcontractors, Suppliers, and their employees to the same extent as CONTRACTOR is responsible for the acts and omissions of its own employees. Nothing contained in this Paragraph shall create any contractual relationship between any Subcontractor and the CITY nor relieve the CONTRACTOR of any liability or obligation under the Contract Documents. The CONTRACTOR shall include these General Conditions and the Supplementary General Conditions as part of all its subcontract and supply agreements.

6.7 PERMITS

A. Unless otherwise provided in any Supplementary General Conditions, the CONTRACTOR shall obtain and pay for all constructions permits and licenses from the agencies having jurisdiction, including the furnishing of insurance and bonds if required by such agencies. The enforcement of such requirements shall not be made the basis for claims for additional compensation by CONTRACTOR. When necessary, the CITY will assist the CONTRACTOR, in obtaining such permits and licenses. The CONTRACTOR shall pay all charges of utility owners for inspection or connections to the WORK.

6.8 PATENT FEES AND ROYALTIES

A. The CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the WORK or the incorporation in the WORK of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the WORK and if to the actual knowledge of the ENGINEER its use is subject to patent rights or copyrights calling for the payment of any license

fee or royalty to others, the existence of such rights will be disclosed by the ENGINEER in the Contract Documents. The CONTRACTOR's indemnification obligation under this Paragraph 6.8 A. for all claims and liabilities arising out of any infringement of patent rights or copyrights incident to the use in the performance of the WORK or resulting from the incorporation in the WORK of any invention, design, process, product or device not specified in the Contract Documents shall be in accordance with Paragraph 6.16 of these General Conditions.

6.9 LAWS AND REGULATIONS

A. The CONTRACTOR shall observe and comply with all Laws and Regulations which in any manner affect those engaged or employed on the WORK, the materials used in the WORK, or the conduct of the WORK including, but not limited to, all applicable safety Laws and Regulations. If any discrepancy or inconsistency should be discovered between the Contract Documents and any such Laws or Regulations, the CONTRACTOR shall report the same in writing to the ENGINEER. Any particular Law or Regulation specified or referred to elsewhere in the Contract Documents shall not in any way limit the obligation of the CONTRACTOR to comply with al other provisions of federal, state, and local laws and regulations. The CONTRACTOR's indemnification obligations for all claims or liability arising from violation of any such law, ordinance, code, order, or regulation, whether by CONTRACTOR or by its employees, Subcontractors or Suppliers shall be in accordance with Paragraph 6.16 of these General Conditions.

6.10 TAXES

A. The CONTRACTOR shall pay all sales, consumer, use, and other similar taxes required to be paid by the CONTRACTOR in accordance with the laws and regulations of the place of the Project which are applicable during the performance of the WORK.

6.11 USE OF PREMISES

A. The CONTRACTOR shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site, the land and areas identified in and permitted by the Contract Documents, and the other land and areas permitted by Laws and Regulations, rights-of-way, permits, and easements. The CONTRACTOR shall assume full liability and responsibility for any damage to any such land or area, or to the owner or occupant thereof or of any land or areas contiguous thereto, resulting from the performance of the WORK. Should any claim be made against the CITY by any such owner or occupant because of the performance of the WORK, the CONTRACTOR shall promptly attempt to settle with such other party by agreement or otherwise resolve the claim through litigation at the CONTRACTOR's sole liability expense. The CONTRACTOR's indemnification obligations for all claims and liability, arising directly, indirectly, or consequentially out of any action, legal or equitable, brought by any such owner

or occupant against the CITY, its consultants, subconsultants, and the officers, directors, employees and agents of each and any of them to the extent caused by or based upon the CONTRACTOR's performance of the WORK shall be in accordance with Paragraph 6.16 of these General Conditions.

6.12 SAFETY AND PROTECTION

A. The CONTRACTOR shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the WORK. The CONTRACTOR shall be responsible for the direction and control of the work assigned and for assuring that all workers on the project understand the hazards of the work involved and the safe work procedures required for each job. The CONTRACTOR shall assure that its subcontractors of all tiers shall, without expense to the CITY, comply with this safety responsibility. No work shall proceed until each worker and subcontractor understands the scope of the work and all safety rules and work procedures to be followed. The CONTRACTOR shall not allow a new employee or new subcontractor to begin work on CITY projects without a full and proper safety orientation. The CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage to prevent damage, injury or loss to:

1. All persons at the Site and other persons and organizations who may be affected thereby;

2. All the WORK and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. Other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of the performance of the WORK.

B. The CONTRACTOR shall comply with all applicable Laws and Regulations relating to the safety of persons or property or to the protection of persons or property from damage, injury, or loss and shall erect and maintain all necessary safeguards for such safety and protection. The CONTRACTOR shall notify owners of adjacent property and utilities when prosecution of the WORK may effect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property. CONTRACTOR'S duties and responsibilities for safety and for protection of the WORK shall continue until such time as all the WORK is completed and ENGINEER has issued a notice to the CONTRACTOR in accordance with Paragraph 14.7 B. that the WORK is acceptable.

C. The CONTRACTOR shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention

of accidents and the maintaining and supervising of safety precautions and programs.

D. Materials that contain hazardous substances or mixtures may be required on the WORK. A Material Safety Data Sheet shall be made available at the Site by the CONTRACTOR for every hazardous product used.

E. Material usage shall strictly conform to OSHA safety requirements and all manufacturer's warnings and application instructions listed on the Material Safety Data Sheet and on the product container label.

F. The CONTRACTOR shall be responsible for the exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

G. The CONTRACTOR shall notify the ENGINEER if it considers a specified product or its intended use to be unsafe. This notification must be given to the ENGINEER prior to the product being ordered, or if provided by some other party, prior to the product being incorporated in the WORK.

H. Before starting work, the CONTRACTOR shall submit a written safety program to the CITY. The objective of the safety program shall be accident prevention. Such program shall include, but not be limited to, the following:

1. An organization chart and accompanying narrative which describes the responsibility for employee and public safety of those individuals who control each phase of operations and set forth in writing the policies and procedures to be followed by all personnel. The chart shall also show the CONTRACTOR's internal lines of communication (including subcontractors) for the program.

2. A specific program for communication between the CONTRACTOR and CITY on safety matters. The CONTRACTOR shall also designate one person with whom official contact can be made by the CITY on safety matters.

3. Evidence that the CONTRACTOR has become thoroughly familiar with the potential hazards of the work and applicable federal and state regulations.

4. Specific safety procedures and guidelines for conduct of the Work.

5. The CITY's review, comment upon, and/or acceptance of the CONTRACTOR's safety program and/or plan does not in any way negate the responsibilities of the CONTRACTOR for safety or place any responsibility upon the CITY for such safety. Such review comment and/or

acceptance shall not be construed as limiting in any manner the CONTRACTOR's obligation to undertake any action which may be necessary or required to establish and maintain safe working conditions at the site.

6.13 EMERGENCIES

A. In emergencies affecting the safety or protection of persons or the WORK or property at the Site or adjacent thereto, CONTRACTOR, without special instruction or authorization from ENGINEER, is obligated to immediately act to prevent threatened damage, injury, or loss. CONTRACTOR shall give ENGINEER prompt written notice if CONTRACTOR believes that any significant changes in the WORK or variations from the Contract Documents have been caused thereby. If ENGINEER determines that a change in the Contract Documents have been caused thereby. If ENGINEER determines that a change in the Contract Documents is required because of the action taken by CONTRACTOR in response to such an emergency, a Change Order will be issued to document the consequences of such action.

6.14 SUBMITTALS

A. After checking and verifying all field measurements and after complying with applicable procedures specified in the Special Provisions, the CONTRACTOR shall submit to the ENGINEER for review all Shop Drawings and details of all structural and reinforcing steel, equipment, electrical controls, structural fabrications, pipe, pipe joints, special pipe sections, and other appurtenances in accordance with the accepted schedule of Shop Drawing submittals specified in the Special Provisions or as otherwise provided in the Contract Documents.

B. The ENGINEER’S review will be only to determine if the items covered by the submittals will, after installation or incorporation in the WORK, generally conform to the Contract Documents and with the design concept of the completed Project. The ENGINEER's favorable review shall be obtained before any such items are manufactured or used in the work. The favorable review of Drawings by the ENGINEER shall apply in general design only and shall in no way relieve the CONTRACTOR from responsibility for errors or omissions contained therein. Favorable review by the ENGINEER shall not relieve the CONTRACTOR of its obligation to meet safety requirements and all other requirements of law. The ENGINEER will start reviewing the CONTRACTOR's submittals only after the Notice to Proceed is issued by the CITY with the exception of some unusual long lead items which may require submittals prior to issuing the Notice to Proceed.

C. The CONTRACTOR shall also submit to the ENGINEER for review all Samples in accordance with the accepted schedule of Sample submittals specified in the Special Provisions or as otherwise provided in the Contract Documents.

D. Before submittal of each Shop Drawing or Sample, the CONTRACTOR shall have determined and verified all quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar data with respect thereto and reviewed or coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the WORK and the Contract Documents. The CONTRACTOR shall provide submittals in accordance with the requirements of the Special Provisions or as otherwise provided in the Contract Documents.

E. Shop-drawing submittal and coordination are the responsibility of the prime contractor; this responsibility shall not be delegated in whole or in part to subcontractors or suppliers. Any designation of work "by others," shown on Shop Drawings, shall mean that the work will be the responsibility of the CONTRACTOR rather than the subcontractor or supplier who has prepared the Shop Drawings.

Submittals shall be prepared in such form that data can be identified with the applicable Specification paragraph. The data shall demonstrate clearly compliance with the Drawings and Specifications and shall relate to the specific equipment to be furnished. Where manufacturer's standard drawings are employed, they shall be marked clearly to show what portions of the data are applicable to this Project.

F. Review of shop-drawing submittals by the ENGINEER has as its primary objective the completion for the CITY of a Project in full conformance with the Drawings and Specifications, unmarred by field corrections, and within the time provided. In addition to this primary objective, shop-drawing review as a secondary objective will assist the CONTRACTOR in its procurement of equipment that will meet all requirements of the Drawings and Specifications, will fit the structures detailed on the Drawings, will be complete with respect to piping, electrical, and control connections, will have the proper functional characteristics, and will become an integral part of a complete operating facility. Acceptance of Shop Drawings and submittals does not constitute a change order to the Contract requirements.

G. Where the CONTRACTOR is required by these Specifications to make submittals, they shall be submitted to the ENGINEER with a letter of transmittal and in sufficient number of copies to allow a distribution of at least one (1) copy to all parties needing a copy to carry out the provisions of the Specifications, including three (3) copies to be retained by the ENGINEER. The ENGINEER shall determine the appropriate number of such copies required at the time of the preconstruction conference.

H. Within twenty-five (25) calendar days of receipt by the ENGINEER of each of the CONTRACTOR's submissions and all appurtenant data required for their review, the appropriate number of copies will be returned to the CONTRACTOR with one of the following notations:

1. Resubmittal not required; correction, if any, noted.

2. Correct and resubmit; corrections noted.

Returned copies of Drawings marked with Notation "1" authorize the CONTRACTOR to proceed with the operations covered by such returned copies, provided that such operations be subject to the comments, if any, shown on such returned copies. Returned copies of Drawings marked with Notation "2" shall be corrected, as necessary and required, and shall be submitted in the same manner as before.

I. When submittals are favorably reviewed, the ENGINEER will retain three (3) copies and will return all other copies to the CONTRACTOR. When submittals are not favorably reviewed, the ENGINEER will retain only two (2) copies and will return all others to the CONTRACTOR. It is considered reasonable that the CONTRACTOR shall make a complete and acceptable submission to the ENGINEER at least by the second submission of data. The CITY reserves the right to deduct monies from payments due the CONTRACTOR to cover additional costs of the ENGINEER's review beyond the second submission.

J. Favorable review by the ENGINEER will not constitute acceptance by the ENGINEER of any responsibility for the accuracy, coordination, and completeness of the Shop Drawings or the items of equipment represented on the Drawings. Accuracy, coordination, and completeness of Shop Drawings shall be the sole responsibility of the CONTRACTOR, including responsibility to back check comments, corrections, and modifications from the ENGINEER's review before fabrication. Supplemental, specific requirements for Shop Drawings and details are contained in the applicable technical sections of these Specifications.

K. Copies of schedules and Shop Drawings submitted to the ENGINEER for review shall be such as to provide three (3) copies for the ENGINEER's files, and such additional copies as the CONTRACTOR may desire for its own office files and/or for distribution by it to subcontractors or vendors. Exceptions will be noted in specific sections of Specifications. All Shop Drawings and supporting data, catalogs, and schedules shall be submitted as the instruments of the CONTRACTOR, who shall be responsible for their accuracy and completeness. These submittals may be prepared by the CONTRACTOR, subcontractors, or suppliers, but the CONTRACTOR shall ascertain that submittals meet all of the requirements of the Contract, while conforming to structural, space, and access conditions at the point of installation. The CONTRACTOR shall check all submittals before submitting them to the ENGINEER.

L. The ENGINEER shall check and review schedules, drawings, etc., submitted by the CONTRACTOR only for general design conformance with the concept of the Project and compliance with the Contract. Shop Drawings shall not be used to order products' fabrication or delivery for construction or installation unless

submitted to and favorably reviewed by the ENGINEER. Acceptance by the ENGINEER of any drawings, method of work, or any information regarding materials and equipment the CONTRACTOR proposes to furnish shall not relieve the CONTRACTOR of its responsibility for any errors therein and shall not be regarded as an assumption of risks or liability by the Design ENGINEER or the CITY, or any officer or employee thereof, and the CONTRACTOR shall have no recourse against the CITY under the Contract on account of the failure or partial failure or inefficiency or insufficiency of any plan or method of work or material and equipment so accepted. Such acceptance shall be considered to mean merely that the ENGINEER has no objection to the CONTRACTOR using, upon its own full responsibility, the plan or method of work proposed or furnishing the materials and equipment proposed.

6.15 CONTINUING THE WORK

A. The CONTRACTOR shall carry on the WORK and adhere to the progress schedule during all disputes or disagreements with the CITY. No WORK shall be delayed or postponed pending resolution of any disputes or disagreements, except as the CONTRACTOR and the CITY may otherwise agree in writing.

6.16 CONTRACTOR'S GENERAL WARRANTY AND GUARANTEE

A. CONTRACTOR warrants and guarantees that all WORK will be in accordance with the Contract Documents and will not be defective. The CONTRACTOR represents that the WORK performed pursuant to the Contract shall be of the quality specified or of the highest quality if no quality is specified, and shall conform to the Contract Documents. The CONTRACTOR warrants all equipment, material, products, and workmanship furnished and all work performed under the Contract against defects for a period of one (1) year after final acceptance regardless of whether the same were furnished or performed by the CONTRACTOR or by any of its subcontractors or suppliers of any tier.

B. The CONTRACTOR shall make, at its own expense, all repairs and/or replacements necessitated by defects in the equipment, materials, and/or products and in the workmanship provided by the CONTRACTOR or any of its subcontractors that become evident within the warranty period.

C. Upon receipt of written notice from the CITY of any breach of warranty during the applicable warranty period, the affected item shall be redesigned, repaired, or replaced by the CONTRACTOR and the CONTRACTOR shall perform such tests as the CITY may require to verify that such redesign, repair, and replacement comply with the requirements of the Contract. The CITY shall have the right to operate and use such equipment, materials, and/or products until they can, without damage to the CITY, be taken out of service for correction or replacement by the CONTRACTOR. As to the redesigned, repaired, or replaced work, the CONTRACTOR warrants such redesigned, repaired, or replaced work against

defective design, equipment, materials, products, and workmanship for a period of one (1) year from and after the date of satisfactory completion of such redesigned, repaired, or replaced work. The CITY reserves the right to require that the CONTRACTOR performs such repair or replacement work.

D. The CITY also reserves the right to make such repairs or replacements, if, within seven (7) calendar days after the mailing of a notice in writing to the CONTRACTOR and Surety, the CONTRACTOR shall neglect to make or undertake with due diligence the aforesaid repairs or replacements and that Surety within seven (7) calendar days after mailing of a notice in writing of such negligence of the CONTRACTOR shall neglect to make or undertake with due diligence the aforesaid repairs or replacements itself, provided, however, that in the case of an emergency where in the opinion of the CITY delay would cause hazard to health or serious loss or damage, repair may be made without notice being sent to the CONTRACTOR or Surety, and the CONTRACTOR shall pay the cost thereof.

E. All costs including workforce and materials incidental to such redesign, repair, replacement, and testing, including the removal, replacement, and reinstallation of equipment necessary to gain access and all other costs incurred as the result of a breach of warranty shall be borne by the CONTRACTOR whether performed by the CITY or the CONTRACTOR.

F. Nothing in this section shall be construed to limit, relieve, or release the CONTRACTOR, subcontractor's, and equipment, materials, and/or products suppliers, and other service providers' liability to the CITY for damages sustained as the result of latent defects in the workmanship, equipment, materials, and/or products done and/or furnished by the CONTRACTOR, its subcontractors, suppliers and/or other service providers.

G. The Performance Bond shall extend for a period of one (1) year after acceptance of the Contract by the CITY and shall cover the CONTRACTOR’s obligations resulting from the warranty requirements herein specified.

H. CONTRACTOR’s warranty and guarantee hereunder excludes defects or damage caused by:

1. Abuse, modification, or improper maintenance or operation by persons other than CONTRACTOR, Subcontractors, or Suppliers, or other individual or entity for whom CONTRACTOR is responsible;

2. Normal wear and tear under normal usage.

I. CONTRACTOR’s obligation to perform and complete the WORK in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of WORK that is not in accordance with the Contract

Documents or a release of CONTRACTOR's obligation to perform the WORK in accordance with the Contract Documents:

1. Observations by ENGINEER;

2. Recommendation by ENGINEER or payment by CITY of any progress or final payment;

3. The issuance of a Certificate of Completion by the CITY;

4. Use or occupancy of the WORK or any part thereof by the CITY;

5. Any acceptance by CITY or any failure to do so;

6. Any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice or acceptability by ENGINEER pursuant to Paragraph 14.7 B.;

7. Any inspection, test, or approval by others; or

8. Any correction of Defective Work by CITY.

6.17 INDEMNIFICATION

A. Contractor shall indemnify, defend with counsel acceptable to City, and hold harmless to the full extent permitted by law, City and its officers, officials, employees, agents and volunteers from and against any and all liability, loss, damage, claims, expenses and costs (including, without limitation, attorney fees and costs and fees of litigation) (collectively, "Liability") of every nature arising out of or in connection with Contractor's performance of the WORK or its failure to comply with any of its obligations contained in this Agreement, except such Liability caused by the active negligence, sole negligence or willful misconduct of the City. Such indemnification by the CONTRACTOR shall include, but not be limited to, the following:

1. Liability or claims resulting directly or indirectly from the negligence or carelessness of the CONTRACTOR, its subcontractors, employees, or agents in the performance of the WORK, or in guarding or maintaining the same, or from any improper materials, implements, or appliances used in its construction, or by or on account of any act or omission of the CONTRACTOR, its employees, or agents;

2. Liability or claims arising directly or indirectly from bodily injury, occupational sickness or disease, or death of the CONTRACTOR's, or Supplier's own employees, or agents engaged in the WORK resulting in

actions brought by or on behalf of such employees against the CITY and/or the ENGINEER;

3. Liability or claims arising directly or indirectly from or based on the violation of any Laws or Regulations, whether by the CONTRACTOR, its subcontractors, employees, or agents;

4. Liability or claims arising directly or indirectly from the use or manufacture by the CONTRACTOR, its subcontractors, employees, or agents in the performance of this Agreement of any copyrighted or uncopyrighted composition, secret process, patented or unpatented invention, article, or appliance, unless otherwise specified stipulated in this Agreement;

5. Liability or claims arising directly or indirectly from the breach of any warranties, whether express or implied, made to the CITY or any other parties by the CONTRACTOR, its subcontractors, employees, or agents;

6. Liability or claims arising directly or indirectly from the willful misconduct of the CONTRACTOR, its subcontractors, employees, or agents;

7. Liability or claims arising directly or indirectly from any breach of the obligations assumed in this Agreement by the CONTRACTOR;

8. Liability or claims arising directly or indirectly from, relating to, or resulting from a hazardous condition created by the CONTRACTOR, Subcontractors, Suppliers, or any of their employees or agents, and;

9. Liability or claims arising directly, or indirectly, or consequentially out of any action, legal or equitable, brought against the CITY, the ENGINEER, their consultants, subconsultants, and the officers, directors, employees and agents of each or any of them, to the extent caused by the CONTRACTOR's use of any premises acquired by permits, rights of way, or easements, the Site, or any land or area contiguous thereto or its performance of the WORK thereon.

B. The CONTRACTOR shall reimburse the CITY for all costs and expenses, (including but not limited to fees and charges of engineers, architects, attorneys, and other professionals and court costs of appeal) incurred by said CITY in enforcing the provisions of this Paragraph.

C. The indemnification obligation under this Article 11 shall not be limited in any way by any limitation on the amount or type of insurance carried by CONTRACTOR 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 workers' compensation acts, disability benefit acts, or other employee benefit acts.

D. Pursuant to California Public Contract Code Section 9201, City shall timely notify Contractor of receipt of any third-party claim relating to this Agreement.

6.18 CONTRACTOR'S DAILY REPORTS

A. The CONTRACTOR shall complete a daily report indicating location worked, total manpower for each construction trade, major equipment on Site, each Subcontractor's manpower and equipment, weather conditions, and other related information involved in the performance of the WORK. These components will be decided by the ENGINEER.

6.19 CONTRACT DOCUMENTS AND RECORD DRAWINGS

A. The CONTRACTOR shall keep on the work site a copy of the Contract Documents and shall at all times give the ENGINEER access thereto. Any drawings included in the Specifications shall be regarded as part thereto and of the Contract. Anything mentioned in these Specifications and not shown on the Project Drawings, or shown on the Project Drawings and not mentioned in these Specifications, shall be of like effect as though shown or mentioned in both. The ENGINEER will furnish from time to time such detail drawings, plans, profiles, and information as he may consider necessary for the CONTRACTOR's guidance. It shall be the duty of the CONTRACTOR to see that the provisions of the Contract Documents are complied with in detail irrespective of the inspection given the work during its progress by the ENGINEER. Any failure on the part of the CONTRACTOR to observe the requirements contained in the Contract Documents will be sufficient cause for the rejection of the work at any time before its acceptance.

B. The CONTRACTOR shall maintain, at the jobsite, one record set of Drawings in good order and clearly marked to show any deviations which have been made from the Drawings, including concealed construction and utility features which are revealed during the course of construction. Marked prints shall be updated at least once each week and shall be available to the ENGINEER for review as to currency prior to developing partial payment estimates. Upon completion of the work, the marked set of prints shall be delivered to the ENGINEER.

C. In the case of those drawings which depict the detail requirement for equipment to be assembled and wired in the factory, such as motor control centers and the like, the Record Drawings shall be updated by indicating those portions which are superseded by change order drawings or final shop drawings, and by including appropriate reference information describing the change orders by number and the shop drawings by manufacturer, drawing, and revision numbers.

D. Requests for partial payments will not be approved if the updated set of Drawings is not in good order or is not kept current. Request for final payment will not be

approved until the complete and correct Record Drawings are delivered to the ENGINEER.

6.20 CLEAN UP

The CONTRACTOR shall, at all times, keep the premises, occupied by it in relation to this Contract, in a neat, clean, and safe condition and at all times provide reasonable access thereto. The CONTRACTOR shall, as a minimum, conduct daily inspections to verify that requirements of this Article are being met.

A. During the progress of the WORK, the CONTRACTOR shall:

1. Retain all stored items in an orderly arrangement allowing maximum access, not impeding drainage or traffic, and providing the required protection of material.

2. Provide adequate storage of all items awaiting removal from the jobsite, observing all requirements for fire protection and protection of the environment.

3. Remove any accumulation of scrap, debris, waste material, and other items not required for construction of this work.

4. Dispose of existing materials and equipment to be demolished and removed and all trash such as broken concrete, wood blocking, shipping containers, etc., resulting from the contract work off the premises occupied by the CONTRACTOR, including CITY property, at the CONTRACTOR's expense. CITY-leased dumpsters and other disposal containers on CITY's property, unless specifically provided by the CONTRACTOR, shall not be used by the CONTRACTOR.

5. Maintain all excavation, embankments, haul roads, permanent access roads, Plant site, waste disposal areas, borrow areas, and all other work areas within contract work limits free from dust, as determined by the ENGINEER. Industry-accepted methods of dust control suitable for the area involved, such as sprinkling, chemical treatment, light bituminous treatment, or similar methods, will be permitted. No separate payment will be made to the CONTRACTOR for dust control.

B. If the CONTRACTOR fails to comply with any of the foregoing, the CITY will transmit written notification of noncompliance. If, within five (5) calendar days of the written notification, the CONTRACTOR fails to comply, cleanup may be undertaken by the CITY at the expense of the CONTRACTOR.

C. Upon completion of any portion of any WORK, the CONTRACTOR shall promptly remove all of its equipment, temporary structures, and surplus

construction and other materials not to be used at or near the same location during later stages of work. Upon completion of any WORK and before final inspection is made, the CONTRACTOR shall unless otherwise specifically directed by the ENGINEER:

1. Remove from the job site all plant, buildings, tools, surplus materials, equipment, forms, rubbish, scrap, debris, and waste.

2. Clean all paved areas on the site. Completely remove all resultant debris.

3. Visually inspect all interior surfaces, and remove all traces of soil, waste material, smudges, and other foreign matter. Remove all traces of splashed materials from adjacent surfaces. Remove all paint droppings, spots, stains, and dirt from finished surfaces. Use only approved cleaning materials and equipment.

4. Restore any improved area used for the CONTRACTOR's work or material storage to its condition at the time the CONTRACTOR moved onto the site or to the satisfaction of the ENGINEER.

5. Schedule final cleaning and improvement restoration to enable the CITY to accept a completely clean and restored project.

6.21 STORM WATER POLLUTION PREVENTION

A. General

1. Prevention - The CONTRACTOR shall prevent the pollution of storm drain systems and creeks on or near the construction project site(s) resulting from the construction operation. The CONTRACTOR shall keep pollution out of storm drains by reducing the possibility of accidental discharge of materials and wastes, by reducing erosion and sedimentation, and by any action as required. The CONTRACTOR shall train all employees and subcontractors on the storm water pollution prevention requirements contained in these Specifications and ensure that all employees and subcontractors are aware of the consequences as described in subsection A.3. below. The CONTRACTOR shall include appropriate subcontract provisions to ensure that these requirements are met by all subcontractors.

2. Notification - If the CONTRACTOR causes or permits the spillage or overflow of any sewage, oil, or petroleum product, hazardous substance, contaminant, or waste that may result in the fluid or substance being discharged directly or indirectly into any storm drains, creeks, wetlands, or other manmade or natural waterways the CONTRACTOR shall notify the CITY as soon as possible to the extent notification can be provided without substantially impeding cleanup or other emergency measures. In no event

shall such notification be later than one hour after knowledge of the occurrence.

3. Cleanup - Immediately upon gaining knowledge of such spillage, overflow, or discharge, the CONTRACTOR shall eliminate the cause of the spillage, overflow, or discharge and take action to minimize any damages. The CONTRACTOR shall also immediately implement a cleanup program. The cleanup, including sampling and testing required by regulatory agencies to determine the nature and level of contamination shall be performed and completed to the satisfaction of the various regulatory agencies involved and the CITY, at the expense of the CONTRACTOR. Any fines, penalties, and/or subsequent actions imposed upon the CITY and/or the CONTRACTOR by regulatory agencies related to the spillage, overflow, or discharge and any subsequent monitoring, testing, and reporting, as required by regulatory agencies, shall also be at the expense of the CONTRACTOR. The CONTRACTOR shall keep a stockpile of spill cleanup materials, such as rags or absorbents, readily accessible on site. The quantity of cleanup materials shall be appropriate in consideration of the risk of an occurrence of a spill, overflow or discharge.

B. Management of Nonhazardous Material and/or Waste

1. Designated Area - The CONTRACTOR shall propose designated areas of the project site, for approval by the ENGINEER, suitable for material delivery, storage, and waste collection that to the maximum extent practicable are near construction entrances and away from catch basins, gutters, drainage courses, and creeks.

2. Backfill or Excavated Material - The CONTRACTOR shall not allow backfill or excavated material to enter the storm drains or creeks. When rain is forecast within 24 hours or during wet weather, the CONTRACTOR may be required to cover such material with a tarpaulin and to surround the material with sand bags.

3. Street Sweeping - At least once per week or more frequently as directed by the ENGINEER, the CONTRACTOR shall clean and sweep roadways and on-site paved areas of all materials attributed to or involved in the work. The CONTRACTOR shall not use water to flush down streets in place of street sweeping.

4. Disposal - At the end of each working day, the CONTRACTOR shall collect all scrap, debris, and waste material, and dispose of such materials properly. The materials may be stored in the CONTRACTOR’s yard in stockpiles or placed in dumpsters. The CONTRACTOR shall inspect dumpsters for leaks and replace or repair dumpsters that leak. The CONTRACTOR shall not discharge water from cleaning dumpsters on site.

The CONTRACTOR shall arrange for regular waste collection before dumpsters overflow.

C. Management of Hazardous Material and/or Waste

1. Storage - The CONTRACTOR shall label and store all hazardous materials, such as pesticides, paints, thinners, solvents, and fuels, and all hazardous wastes, such as waste oil and antifreeze in accordance with all applicable state and federal regulations. The CONTRACTOR shall store all hazardous materials and all hazardous wastes in accordance with secondary containment regulations. All such materials and wastes shall be covered, as needed, to avoid rainwater becoming polluted with hazardous constituents which could result in potential management of collected rain water as a hazardous waste. The CONTRACTOR shall keep an accurate, up-to-date inventory, including Material Safety Data Sheets (MSDSs), of hazardous materials and hazardous wastes stored on site.

2. Usage - When rain is forecast within 24 hours or during wet weather, the CONTRACTOR shall refrain from applying chemicals in outside areas. The CONTRACTOR shall follow material manufacturer's instructions regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals. The CONTRACTOR shall post warning signs in areas treated with chemicals.

3. Disposal - The CONTRACTOR shall arrange for regular hazardous waste collection to comply with time limits on storage of hazardous wastes. The CONTRACTOR shall dispose of hazardous waste in accordance with all applicable local, state and federal regulations. The CONTRACTOR shall not wash any spilled material into streets, gutters, storm drains, or creeks and shall not bury spilled hazardous materials. The CONTRACTOR shall report any hazardous materials spill to the CITY in accordance with Section A.2 above.

D. Vehicle/Equipment Cleaning, Maintenance, and Fueling

1. General - The CONTRACTOR shall inspect vehicles and equipment arriving on site for leaking fluids and shall promptly repair leaking vehicles and equipment. Drip pans shall be used to catch leaks until repairs are made.

   The CONTRACTOR shall comply with federal, state, and city requirements for aboveground storage tanks.

2. Cleaning - The CONTRACTOR shall perform vehicle or equipment cleaning with water only in a designated, bermed area that will not allow rinse water to run off site into streets, gutters, storm drains, or creeks. Soaps,

solvents, degreasers, steam-cleaning equipment, or equivalent methods shall not be allowed.

3. Maintenance and Fueling - The CONTRACTOR shall perform maintenance and fueling of vehicles or equipment in areas that will not allow run-on of storm water or runoff of spills to storm drains and provide for confined clean-up. Examples are working in bermed areas or utilizing drip pans. The CONTRACTOR shall not contaminate the soils or groundwater with such maintenance and fueling activities.

   The CONTRACTOR shall use secondary containment, such as a drip pan, to catch leaks or spills any time that vehicle or equipment fluids are dispensed, changed, or poured, and shall clean up leaks and spills of vehicle or equipment fluids immediately and dispose of the waste and cleanup materials as hazardous waste, as described in Section C.3 above.

E. Dewatering Operations

1. Sediment Control - The CONTRACTOR shall route water through a control measure, such as a sediment trap, sediment basin, or Baker tank, to remove settleable solids prior to discharge to the storm drain system. Straw bales shall be placed in front of storm drain inlets as required. Filtration of the water following the control measure may be required on a case-by-case basis. Approval of the control measure shall be obtained in advance from the ENGINEER. If the ENGINEER determines that the dewatering operation would not generate an appreciable amount of settleable solids, the control measure requirement above may be waived.

2. Contaminated Groundwater - If the project is within an area of known groundwater contamination or if contamination is found, water from dewatering operations shall be tested prior to discharge. If the water quality meets Regional Water Quality Control Board (RWQCB) standards, it may be discharged to a storm drain or creek. Otherwise, the water shall be hauled off site for proper disposal.

F. Paving or Oiling Operations

1. When rain is forecast within 24 hours or during wet weather, the ENGINEER may prevent the CONTRACTOR from paving or oiling the street. The ENGINEER may direct the CONTRACTOR to protect drainage courses by using control measures, such as earth dike, straw bale, and sand bag, to divert runoff or trap and filter sediment.

2. The CONTRACTOR shall prevent saw-cut slurry from entering catch basins and storm drains by limiting the area over which the slurry may spread.

3. The CONTRACTOR shall cover catch basins and manholes when paving or applying seal coat, tack coat, slurry seal, or fog seal.

4. The CONTRACTOR shall not sweep or wash down excess sand (placed as part of a sand seal or to absorb excess oil) into gutters, storm drains, or creeks. The CONTRACTOR shall either collect the sand and return it to the stockpile or dispose of it in a trash container.

G. Concrete, Grout, and Mortar Waste Management

1. Concrete Truck/Equipment Washout - The CONTRACTOR shall not wash out concrete trucks or equipment into streets, gutters, storm drains, or creeks. The CONTRACTOR shall perform washout of concrete trucks or equipment off site or in a designated area on site where the water will flow onto dirt or into a temporary pit in a dirt area. The CONTRACTOR shall let the water percolate into the soil and dispose of the hardened concrete in a trash container. If a suitable dirt area is not available, the CONTRACTOR shall collect the wash water and remove it off site.

2. Exposed Aggregate Concrete Wash Water - The CONTRACTOR shall avoid creating runoff by draining water from washing of exposed aggregate concrete to a dirt area. If a suitable dirt area is not available, the CONTRACTOR shall filter the wash water through straw bales or equivalent material before discharging to a storm drain. The CONTRACTOR shall collect sweepings from exposed aggregate concrete for disposal.

H. Paint Disposal and Clean-up

1. Disposal of Unused Paint - The CONTRACTOR shall carefully use, store and dispose of paint, solvents, chemicals, and waste materials in compliance with all applicable state and federal regulations. The CONTRACTOR shall not dispose of paint to sanitary sewer systems or storm drains. The CONTRACTOR shall utilize other recycling and disposal services as follows:

   a. "Recycling Centers" and "Waste Disposals" as may be listed in the yellow pages.

   b. Local household hazardous waste facility if appropriate.

   The CONTRACTOR may dispose of small amounts of leftover latex (water-based) paint by applying the paint to the surface of an

item to be discarded and allowing it to dry thoroughly, then disposing of it in a dumpster.

The CONTRACTOR shall store these materials and conduct cleaning of painting equipment and tools in a designated area that will not allow run-on of storm water or runoff of spills. The CONTRACTOR shall not allow wash water from cleaning of painting equipment and tools into streets, gutters, storm drains, or creeks.

2. Disposal of Paint Clean-up Waste - The CONTRACTOR shall remove as much excess paint as possible from brushes, rollers, and equipment before starting cleanup.

   a. The CONTRACTOR shall not discharge cleaning wastes from oil-based paints, buckets, brushes or tools to the sanitary sewer system. The CONTRACTOR shall retain a certified waste hauler to recycle or to dispose of cleaning wastes from oil-based paints at the CONTRACTOR's expense.

   b. The CONTRACTOR may discharge very small amounts of cleaning wastes from brushes, rollers, buckets, and tools contaminated with latex (water-based) paints to the sanitary sewer system provided they do not contain additives with pollutants of concern (e.g., mercury, tributyltin). Brushes, rollers, and tools containing latex paints may be washed over a sink with plenty of water. Buckets containing latex paints shall first be emptied into the original can or discarded as specified in paragraph 1 above. Should excessive amounts of paint or solvent be found in the wastewater discharged, the CONTRACTOR may be subject to enforcement action by the CITY in accordance with the City Codes.

   c. The CONTRACTOR shall not discharge any of these paint clean-up wastes to storm drains, streets, gutters, or creeks.

   d. Waste Disposal - The CONTRACTOR shall dispose of waste thinner, solvent, and sludge from cleaning of equipment and tools as hazardous waste, as described in Section C.3 above. The CONTRACTOR shall dispose of excess thinners, solvents, and oil- and water-based paint as hazardous waste.

I. Contaminated Soil - If the project is within an area of known soil contamination or evidence of soil contamination is found, the CONTRACTOR shall comply with the requirements of all applicable local, state and federal regulations.

ARTICLE 7 – OTHER WORK

7.1 RELATED WORK AT SITE

A. The CITY may perform other work related to the Project at the Site by the CITY's own forces, have other work performed by utility owners, or let other direct contracts for such other work. If the fact that such other work is to be performed was not noted in the Contract Documents, written notice thereof will be given to the CONTRACTOR prior to starting any such other work.

B. The CONTRACTOR shall afford each person who is performing the other work (including the CITY's employees) proper and safe access to the Site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and shall properly coordinate the WORK with theirs. The CONTRACTOR shall do all cutting, fitting, and patching of the WORK that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. The CONTRACTOR shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will not only cut or alter their work with the written consent of the ENGINEER and the others whose work will be affected.

C. If the proper execution or results of any part of the CONTRACTOR's work depends upon such other work by another, the CONTRACTOR shall inspect and report to the ENGINEER in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for such proper execution and results. The CONTRACTOR's failure to report such delays, defects, or deficiencies will constitute an acceptance of the other work as fit and proper for integration with the CONTRACTOR's work except for latent or nonapparent defects and deficiencies in the other work.

7.2 COORDINATION

A. If the CITY contracts with others for the performance of other work at the Site, CITY will have sole authority and responsibility in respect of such coordination, unless otherwise provided in the Supplementary General Conditions.

ARTICLE 8 – CITY'S RESPONSIBILITIES

8.1 COMMUNICATIONS

A. Except as may be otherwise provided in these General Conditions or the Supplementary General Conditions, the CITY will issue all its communications to the CONTRACTOR through the ENGINEER.

8.2 PAYMENTS

A. The CITY will make payments to the CONTRACTOR as provided in Article 14.

8.3 LANDS, EASEMENTS, AND SURVEYS

A. The CITY's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.1 and 4.6.

8.4 REPORTS AND DRAWINGS

A. The CITY will identify and make available to the CONTRACTOR copies of reports of physical conditions at the Site and drawings of existing structures which have been utilized in preparing the Contract Documents as set forth in Paragraph 4.2.

8.5 CHANGE ORDERS

A. The CITY will execute Change Orders as indicated in Article 10.

8.6 INSPECTIONS AND TESTS

A. The CITY'S responsibility for inspections and tests is set forth in Paragraph 13.3.

8.7 SUSPENSION OF WORK

A. The CITY's right to stop work or suspend work is set forth in Paragraphs 13.4 and 15.1.

8.8 TERMINATION OF AGREEMENT

A. The CITY's right to terminate services of the CONTRACTOR is set forth in Paragraphs 15.2 and 15.3.

8.9 LIMITATION ON CITY'S RESPONSIBILITIES

A. The CITY shall not supervise, direct or have control or authority over, nor be responsible for CONTRACTOR's means, methods, techniques, sequences, or procedures of construction or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of the WORK. CITY will not be responsible for CONTRACTOR's failure to perform or furnish the WORK in accordance with the Contract Documents.

8.10 UNDISCLOSED HAZARDOUS ENVIRONMENTAL CONDITIONS

A. CITY's responsibility in respect to an undisclosed hazardous environmental condition is set forth in Paragraph 4.5.

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.1 CITY'S REPRESENTATIVE

A. The ENGINEER will be the CITY'S representative during the construction period. The ENGINEER shall decide any and all questions which may arise as to the quality or acceptability of materials furnished and work performed, and as to the manner of performance and rate of progress of the work; all questions which arise as to the interpretation of the plans and specifications, the proposal and the contract documents therefor; all questions as to the acceptable fulfillment of the contract on the part of the CONTRACTOR; and all questions as to claim and compensation.

9.2 OBSERVATIONS ON THE SITE

A. The ENGINEER will make observations on the Site during construction to monitor the progress and quality of the WORK and to determine, in general, if the WORK is proceeding in accordance with the Contract Documents. The ENGINEER will not be required to make exhaustive or continuous inspections to check the quality or quantity of the WORK.

9.3 PROJECT REPRESENTATION

A. The ENGINEER may furnish a Resident Project Representative to assist in observing the performance of the WORK. The duties, responsibilities, and limitations of authority of any such Resident Project Representative will be as provided in the Supplementary General Conditions.

9.4 CLARIFICATIONS

A. The ENGINEER will issue with reasonable promptness such written Clarifications of the requirements of the Contract Documents as the ENGINEER may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents.

9.5 AUTHORIZED VARIATIONS IN WORK

A. The ENGINEER may authorize variations in the WORK from the requirements of the Contract Documents. These may be accomplished by a Field Order and will require the CONTRACTOR to perform the WORK involved in a manner that minimizes the impact to the WORK and the Contract Times. If the CONTRACTOR believes that a Field Order justifies an increase in the Contract Price or an extension of the Contract Times, the CONTRACTOR may make a claim therefor as provided in Article 11 or 12.

9.6 REJECTING DEFECTIVE WORK

A. The ENGINEER will have authority to reject Defective Work and will also have authority to require special inspection or testing of the WORK as provided in Article 13.

9.7 CONTRACTOR SUBMITTALS, CHANGE ORDERS, AND PAYMENTS

A. In accordance with the procedures set forth in the General Requirements, the ENGINEER will review all CONTRACTOR submittals.

B. The ENGINEER's responsibilities for Change Orders are set forth in Articles 10, 11, and 12.

C. The ENGINEER's responsibilities for Applications for payment are set forth in Article 14.

9.8 DECISIONS ON DISPUTES

A. The ENGINEER will be the initial interpreter of the requirements of the Contract Documents and of the acceptability of the WORK thereunder. Claims, disputes, and other matters relating to the acceptability of the WORK and interpretation of the requirements of the Contract Document pertaining to the performance of the work shall be determined by the ENGINEER. Any claims in respect to changes in the Contract Price or Contract Times shall be resolved in accordance with the requirements set forth in Articles 10, 11, and 12.

9.9 LIMITATIONS ON ENGINEER'S RESPONSIBILITIES

A. Neither the ENGINEER's authority to act under this Article 9 or other provisions of the Contract Documents nor any decision made by the ENGINEER in good faith either to exercise or not exercise such authority shall give rise to any duty or responsibility of the ENGINEER to the CONTRACTOR, any Subcontractor, any Supplier, any surety for any of them, or any other person or organization performing any of the WORK.

B. Whenever in the Contract Documents the terms "as ordered," "as directed," "as required," "as allowed," "as reviewed," "as approved," or terms of like effect or import are used, or the adjectives "reasonable," "suitable," "acceptable," "proper," or "satisfactory," or adjectives of like effect or import are used to describe a requirement, direction, review, or direction, review, or judgment will be solely to evaluate the WORK for compliance with the requirements of the Contract Documents, and conformance with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents, unless there is a specific statement indicating otherwise. The use of any such term or adjective shall not be effective to assign to the ENGINEER any duty or authority to supervise or

direct the performance of the WORK or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.9 C.

C. The ENGINEER will not supervise, direct, control, or have authority over or be responsible for the CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of the CONTRACTOR to comply with Laws and Regulations applicable to the performance of the WORK. The ENGINEER will not be responsible for the CONTRACTOR's failure to perform the WORK in accordance with the Contract Documents. The ENGINEER will not be responsible for the acts or omissions of the CONTRACTOR nor of any Subcontractor, Supplier, or any other person or organization performing any of the WORK.

ARTICLE 10 – CHANGES IN THE WORK

10.1 GENERAL

A. Without invalidating the Agreement and without notice to any surety, the CITY may at any time or from time to time, order additions, deletions, or revisions in the WORK. Such additions, deletions or revisions will be authorized by a Change Order or Field Order. Upon receipt of any such document, CONTRACTOR shall promptly proceed to implement the additions, deletions, or revisions in the WORK in accordance with the applicable conditions of the Contract Documents.

B. The CONTRACTOR shall not be entitled to an increase in the contract Price nor an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented by Change Order, except in the case of an emergency and except in the case of uncovering work as provided in Paragraph 13.3.F and G.

C. The CITY and the CONTRACTOR shall execute appropriate Change Orders covering:

1. Changes in the WORK which are ordered by the CITY pursuant to Paragraph 10.1 A.;

2. Changes required because of acceptance of Defective Work under Paragraph 13.6; and

3. Changes in the Contract Price or Contract Times which are agreed to by the parties under Articles 11 and/or 12, respectively.

D. If notice of any change in the WORK is required to be given to a surety, the giving of any such notice shall be the CONTRACTOR's responsibility. If the change in the WORK affects the Contract Price, the CITY may require an adjustment to the

amount of any applicable Bond and the amount of each applicable Bond shall be adjusted accordingly.

E. If the CITY and CONTRACTOR agree as to the extent, if any, of an increase in the Contract Price or an extension or shortening of the Contract Times that should be allowed as a result of a Field Order, the CONTRACTOR shall proceed so as to minimize the impact on and delays to the WORK pending the issuance of a Change Order.

F. If the CITY and the CONTRACTOR are unable to agree as to the extent, if any, of an increase in the Contract Price or an extension or shortening of the Contract Times that should be allowed as a result of a Field Order, the ENGINEER can direct the CONTRACTOR to proceed on the basis of time and materials so as to minimize the impact on and delays to the WORK, and the CONTRACTOR may make a claim as provided in Articles 11 and 12.

10.2 ALLOWABLE QUANTITY VARIATIONS

A. In the event of an increase or decrease in the quantity of any bid item under a unit price contract, the total amount of work actually done or materials or equipment furnished will be paid for according to the unit price established for such work under the Contract Documents, wherever such unit price has been established; provided, that an adjustment in the Contract Price may be made for changes which result in an increase or decrease in excess of 25 percent of the estimated quantity of any unit price bid item of the WORK.

B. In the event a part of the WORK is to be entirely eliminated and no lump sum or unit price is named in the Contract Documents to cover such eliminated work, the price of the eliminated work shall be agreed upon by the CITY and the CONTRACTOR by Change Order.

ARTICLE 11 – CHANGE OF CONTRACT PRICE

11.1 GENERAL

A. The Contract Price constitutes the total compensation payable to the CONTRACTOR FOR PERFORMING THE work. All duties, responsibilities, and obligations assigned to or undertaken by the CONTRACTOR to complete the WORK shall be at its expense without change in the Contract Price.

B. The Contract Price may only be changed by a Change Order. The value of any work covered by a Change Order or of any claim for an increase or decrease in the Contract Price shall be determined in one of the following ways:

1. Where the work involved is covered by unit prices contained in the Contract Documents, by application of unit prices to the qualities o the items involved.

2. By mutual acceptance of a lump sum, which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.4; or

3. On the basis of the cost of work (determined as provided in Paragraph 11.3) plus the CONTRACTOR's overhead and profit (determined as provided in Paragraph 11.4).

C. Any claim for an increase in the Contract Price shall be based on written notice delivered by the CONTRACTOR to the ENGINEER promptly (but in no event later than 10 days) after the start of the event giving rise to the claim and shall state the general nature of the claim. Notice of the amount of the claim with supporting data shall be delivered within 60 days after the start of such event (unless the ENGINEER allows an additional period of time to ascertain more accurate data in support of the claim) and shall be accompanied by the CONTRACTOR's written statement that the amount claimed covers all known amounts (direct, indirect, and consequential) to which the CONTRACTOR is entitled as a result of such event. All claims for adjustment in the Contract Price will be determined by the ENGINEER. No claim for an adjustment in the Contract Price will be valid if not submitted in accordance with this Paragraph 11.1 C.

11.2 COSTS RELATING TO WEATHER

A. The CONTRACTOR shall have no claims against the CITY for damages for any injury to work, materials, or equipment, resulting from the action of the elements. If, however, in the opinion of the ENGINEER, the CONTRACTOR has made all reasonable efforts to protect the materials, equipment, and work, the CONTRACTOR may be granted a reasonable extension of Contract Times to make proper repairs, renewals, and replacements of the work, materials, or equipment.

11.3 COST OF WORK (BASED ON TIME AND MATERIALS)

A. **General**: The term "cost of work" means the sum of all costs necessarily incurred and paid by the CONTRACTOR for labor, materials, and equipment in the proper performance of extra work. Except as otherwise may be agreed to in writing by the CITY, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items and shall not include any of the costs itemized in Paragraph 11.5.

B. **Labor**: The costs of labor will be the actual cost for wages prevailing for each craft or type of workers performing the extra work at the time the extra work is done, plus employer payments of payroll taxes, workers compensation insurance, liability insurance, health and welfare, pension, vacation, apprenticeship funds, and other

direct costs resulting from federal, state or local laws, as well as assessments or benefits required by lawful collective bargaining agreements. Labor costs for equipment operators and helpers will be paid only when such costs are not included in the invoice for equipment rental. The labor costs for foremen shall be proportioned to all of their assigned work and only that applicable to extra work shall be paid. Nondirect labor costs including superintendence shall be considered part of the markup set out in Paragraph 11.4.

C. **Materials**: Materials must be specifically authorized by the ENGINEER. The cost of materials reported shall be at invoice or lowest current price at which materials are locally available and delivered to the Site in the quantities involved, plus the cost of freight, delivery and storage, subject to the following:

1. All trade discounts and rebaters shall accrue to the CITY, and the CONTRACTOR shall make provisions so that they may be obtained;

2. For materials secured by other than a direct purchase and direct billing to the purchaser, the cost shall be deemed to be the price paid to the actual supplier as determined by the ENGINEER. Except for actual costs incurred in the handling of such materials, markup will not be allowed;

3. Payment for materials from sources owned wholly or in part by the purchaser shall not exceed the price paid by the purchaser for similar materials from said sources on extra work items or the current wholesale price for such materials delivered to the Site, whichever price is lower; and

4. If in the opinion of the ENGINEER the cost of material is excessive, or the CONTRACTOR does not furnish satisfactory evidence of the cost of such material, then the cost shall be deemed to be the lowest current wholesale price for the quantity concerned delivered to the Site less trade discount. The CITY reserves the right to furnish materials for the extra work and no claim will be allowed by the CONTRACTOR for costs and profit on such materials.

D. **Equipment**: The CONTRACTOR will be paid for the use of equipment at the rental rate listed for such equipment specified in the current California Department of Transportation publication entitled "Labor Surcharge and Equipment Rental Rates." Such rental rate will be used to compute payments for equipment whether the equipment is under the CONTRACTOR's control through direct ownership, leasing, renting, or another method of acquisition. The rental rate to be applied for use of each item of equipment will be the rate resulting in the least total cost to the CITY for the total period of use. If it is deemed necessary by the CONTRACTOR to use equipment not listed in the above-referenced publication, an equitable rental rate for the equipment will be established by the ENGINEER. The CONTRACTOR may furnish cost data which might assist the ENGINEER in the

establishment of the rental rate. Payment for equipment shall be subject to the following:

1. All equipment shall, in the opinion of the ENGINEER, be in good working condition and suitable for the purpose for which the equipment is to be used;

2. Before construction equipment is used on the extra work, the CONTRACTOR shall plainly stencil or stamp an identifying number thereon at a conspicuous location, and shall furnish to the ENGINEER, in duplicate, a description of the equipment and its identifying number;

3. Unless otherwise specified, manufacturer's ratings and manufacturer approved modifications shall be used to classify equipment for determination of applicable rental rates. Equipment which has no direct power unit shall be powered by a unit of at least the minimum rating recommended by the manufacturer;

4. Individual pieces of equipment or tools having a replacement value of $500 or less, whether or not consumed by use, will be considered to be small tools and no payment will be made therefore.

E. **Equipment Rental Time**: The rental time to be paid for equipment on the Site will be the time the equipment is in productive operation on the extra work being performed and, in addition, will include the time required to move the equipment to the location of the extra work and return it to the original location or to another location requiring no more time than that required to return it to its original location; except, that moving time will not be paid if the equipment is used on other than the extra work, even though located at the Site of the extra work. Loading and transporting costs will be allowed, in lieu of moving time, when the equipment is moved by means other than its own power, except that no payment will be made for loading and transporting costs when the equipment is used at the Site of the extra work on other than the extra work. Rental time will not be allowed while equipment is inoperative due to breakdowns. The rental time of equipment on the work Site will be computed subject to the following:

1. When hourly rates are listed, any part of an hour less than 30 minutes of operation will be considered to be half-hour of operation, and any part of an hour in excess of 30 minutes will be considered one hour of operation;

2. When daily rates are listed, any part of a day less than 4 hours operation will be considered to be half-day of operation. When owner-operated equipment is used to perform extra work to be paid for on a time and materials basis, the CONTRACTOR will be paid for the equipment and operator, as set forth in Paragraphs 3, 4, and 5, following;

3. Payment for the equipment will be made in accordance with the provisions in Paragraph 11.3 D., herein;

4. Payment for the cost of labor and subsistence or travel allowance will be made at the rates paid by the CONTRACTOR to other workers operating similar equipment already on the Site, or in the absence of such labor, established by collective bargaining agreements for the type of workmen and location of the extra work, whether or not the operator is actually covered by such an agreement. A labor surcharge will be added to the cost of labor described herein accordance with the provisions of Paragraph 11.3 B., herein, which surcharge shall constitute full compensation for payments imposed by state and federal laws and all other payments made to or on behalf of workers other than actual wages; and

5. To the direct cost of equipment rental and labor, computed as provided herein, will be added the allowances for equipment rental and labor as provided in Paragraph 11.4, herein.

F. **Special Services**: Special work or services are defined as that work characterized by extraordinary complexity, sophistication, innovation, or a combination of the foregoing attributes which are unique to the construction industry. The ENGINEER will make estimates for payment for special services and may consider the following:

1. When the ENGINEER and the CONTRACTOR, determine that a special service or work is required which cannot be performed by the forces of the CONTRACTOR or those of any of its Subcontractors, the special service or work may be performed by an entity especially skilled in the work to be performed. After validation of invoices and determination of market values by the ENGINEER, invoices for special services or work based upon the current fair market value thereof may be accepted without complete itemization of labor, material, and equipment rental costs;

2. When the CONTRACTOR is required to perform work necessitating special fabrication or matching process in a fabrication or a machine shop facility away from the Site, the charges for that portion of the work performed at the off-site facility may, by agreement, be accepted as a special service and accordingly, the invoices for the work may be accepted without detailed itemization; and

3. All invoices for special services will be adjusted by deducting all trade discounts. In lieu of the allowances for overhead and profit specified in Paragraph 11.4, herein, an allowance of 15 percent will be added to invoices for special services.

G. **Sureties**; All work performed hereunder shall be subject to all provisions of the Contract Documents and the CONTRACTOR's sureties shall be bound with reference thereto as under the original Agreement. Copies of all amendments to Bonds or supplemental Bonds shall be submitted to the CITY for review prior to the performance of any work hereunder.

11.4 CONTRACTOR'S OVERHEAD AND PROFIT

A. Extra work ordered on the basis of time and materials will be paid for at the actual necessary cost as determined by the ENGINEER, plus allowances for overhead and profit. No additional mark-ups and/or surcharges will be added to the cost. The allowance for overhead and profit will include full compensation for superintendence, taxes, field office expense, extended overhead, home office overhead, and all other items of expense or cost not included in the cost of labor, materials, or equipment provided for under Paragraph 11.3. The allowance for overhead and profit will be made in accordance with the following schedule:

Overhead and Profit Allowance

Labor ..... 20 percent
Materials ..... 15 percent
Equipment ... 15 percent

To the sum of the costs and markups provided for in this Article, an additional 2 percent of the sum will be added as compensation for Bonds and insurance.

B. It is understood that labor, materials, and equipment for extra work may be furnished by the CONTRACTOR or by the Subcontractor on behalf of the CONTRACTOR. When all or any part of the extra work is performed by a Subcontractor, the allowance specified herein will be applied to the labor, materials, and equipment costs of the Subcontractor, to which the CONTRACTOR may add 5 percent of the Subcontractor's total cost for the extra work. Regardless of the number of hierarchical tiers of Subcontractors, the 5 percent increase above the Subcontractor's total cost which includes the allowances for overhead and profit specified herein may be applied one time only.

11.5 EXCLUDED COSTS

A. The term "cost of the work" shall not include any of the following:

1. Payroll costs and other compensation of CONTRACTOR's officers, executives, proprietors, partners, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by CONTRACTOR whether at the Site or in CONTRACTOR's principal or a branch office for general administration of the WORK all of

which are to be considered administrative costs covered by the CONTRACTOR's allowance for overhead and profit;

2. Non-direct labor costs, including superintendence, shall be considered part of the markup for overhead and profit, and no additional payment will be allowed for such;

3. Expenses of CONTRACTOR's principal and branch offices other than CONTRACTOR's office at the Site;

4. Any part of CONTRACTOR's capital expenses, including interest on CONTRACTOR's capital employed for the WORK and charges against CONTRACTOR for delinquent payments;

5. Cost of premiums for all Bonds and for all insurance whether or no CONTRACTOR is required by the Contract Documents to purchase and maintain the same (except as provided by Paragraph 11.4 above);

6. Costs due to the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of Defective Work, disposal of materials or equipment wrongly supplied, and making good any damages to property; and

7. Other overhead or general expense costs of any kind and the cost of any item not specifically and expressly included in Paragraph 11.4.

11.6 CONTRACTOR'S EXTRA WORK REPORT

A. In order to be paid for extra work, the CONTRACTOR must submit a daily extra work report on the form furnished by the ENGINEER. The form must be completely filled out based on the provisions of Paragraphs 11.3 through 11.5 and signed by the CONTRACTOR and ENGINEER at the end of each work day. Failure to complete the form and obtain appropriate signatures by the next working day after the extra work of the previous day was completed will result in CONTRACTOR's costs for extra work being disallowed.

ARTICLE 12 – CHANGE OF CONTRACT TIMES

12.1 GENERAL

A. The Contract Times may only be changed by a Change Order. Any claim for an extension of the Contract Times shall be based on written notice delivered by the CONTRACTOR to the ENGINEER promptly (but in no event later than 10 days) after the start of the event giving rise to the claim and stating the general nature of the claim. Notice of the extent of the claim with supporting data shall be delivered within 30 days after the start of such event (unless the ENGINEER allows an additional period of time for the submission of additional or more accurate data in support of the claim) and shall be accompanied by the CONTRACTOR's written statement that the adjustment claimed is the entire adjustment to which the CONTRACTOR is entitled as a result of said event. All claims for adjustment in the Contract Times will be determined by the ENGINEER. No claim for an adjustment in the Contract Times will be valid if not submitted in accordance with the requirements of this Paragraph 12.1 A. An increase in Contract Times does not mean that the CONTRACTOR is due an increase in Contract Price. Only compensable time extensions will result in an increase in Contract Price.

B. All time limits stated in the Contract Documents are of the essence of the Agreement.

C. When CONTRACTOR is prevented from completing any part of the WORK within the Contract Times (or Milestones) due to delay beyond the control of CONTRACTOR, the Contract Times (or Milestones) will be extended in an amount equal to the time lost on the critical path of the WORK due to such delay, if a claim is made therefor as provided in Paragraph 12.1.A. Delays beyond the control of CONTRACTOR shall include, but not be limited to, acts or neglect by CITY; acts or neglect of those performing other work as contemplated by Article 7; and fires, floods, epidemics, abnormal weather conditions, or acts of God. Delays attributable to and within the control of any Subcontractor or Supplier shall be deemed to be delays within the control of the CONTRACTOR.

D. In no event will CITY be liable to CONTRACTOR, any Subcontractor, any Supplier, any other person or organization, or to any surety for or employee or agent of any of them, for any increase in the Contract Price or other damages arising out of or resulting from the following:

1. Delays caused by or within the control of CONTRACTOR; or

2. Delays beyond the control of both CITY and CONTRACTOR including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God, or acts or neglect by those performing other work as contemplated by Article 7.

12.2 EXTENSIONS OF CONTRACT TIMES FOR DELAY DUE TO WEATHER

A. The CONTRACTOR's construction schedule shall anticipate delay due to unusually severe weather. The number of days of anticipated delay is set forth in the Supplementary General Conditions.

B. Contract Times may be extended by the ENGINEER because of delays in excess of the anticipated delay. The CONTRACTOR shall , within 10 days of the beginning of any such delay, notify the ENGINEER in writing and request an extension of Contract Times. The ENGINEER will ascertain the facts and the extent of the delay and extend the Contract Times when, in its judgment, the findings of the fact justify such an extension.

ARTICLE 13 – INSPECTIONS AND TESTS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

13.1 NOTICE OF DEFECTIVE WORK

A. Prompt notice of Defective Work known to the ENGINEER will be given to the CONTRACTOR. All Defective Work, whether or not in place, may be rejected, corrected, or accepted as provided in this Article 13. Defective Work may be rejected even if approved by prior inspection.

13.2 ACCESS TO WORK

A. ENGINEER and other representatives and personnel of CITY, independent testing laboratories, and governmental agencies with jurisdictional interests shall have access to the WORK at reasonable times for their observation, inspecting, and testing. CONTRACTOR shall provide them proper and safe conditions for such access and advise them of CONTRACTOR's Site safety procedures and programs so that they may comply therewith as applicable.

13.3 INSPECTIONS AND TESTS

A. The CONTRACTOR shall give the ENGINEER not less than 24 hours notice of readiness of the WORK for all required inspections, tests, or approvals, and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. The CITY shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. For inspection, tests, or approvals covered by Paragraphs 13.3C. and 13.3D. below;

2. That costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.3G. shall be paid as provided in said Paragraph 13.3G.; and

3. As otherwise provided in the Contract Documents.

C. If Laws and Regulations of any public body having jurisdiction require any WORK (or any part thereof) to be inspected, tested, or approved by an employee or other representative of such public body, CONTRACTOR shall assume full responsibility for arranging and obtaining such inspections, tests or approvals; pay all costs in connection therewith; and furnish the ENGINEER the required certificates of inspection or approval.

D. The CONTRACTOR shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for the ENGINEER's acceptance of materials or equipment to be incorporated in the WORK or acceptance of materials, mix designs, or equipment submitted for approval prior to the CONTRACTOR's purchase thereof for incorporation in the WORK. Such inspections, tests, or approvals shall be performed by organizations acceptable to the ENGINEER.

E. The ENGINEER will make, or have made, such inspections and tests as the ENGINEER deems necessary to see that the WORK is being accomplished in accordance with the requirements of the Contract Documents. Unless otherwise specified in any Supplementary General Conditions, the cost of such inspection and testing will be borne by the CITY. In the event such inspections or tests reveal non-compliance with the requirements of the Contract Documents, the CONTRACTOR shall bear the cost of corrective measures deemed necessary by the ENGINEER, as well as the cost of subsequent reinspection and retesting. Neither observations by the ENGINEER nor inspections, tests, or approvals by others shall relieve the CONTRACTOR from the CONTRACTOR's obligation to perform the WORK in accordance with the Contract Documents.

F. If any WORK (including the work of others) that is to be inspected, tested, or approved is covered without written concurrence of the ENGINEER, it must, if requested by the ENGINEER, be uncovered for observation. Such uncovering shall be at the CONTRACTOR's expense unless the CONTRACTOR has given the ENGINEER not less than 24 hours notice of the CONTRACTOR's intention to perform such test or to cover the same and the ENGINEER has not acted with reasonable promptness in response to such notice.

G. If any WORK is covered contrary to the written request of the ENGINEER, it must, if requested by the ENGINEER, be uncovered for the ENGINEER's observation and recovered at the CONTRACTOR's expense.

H. If the ENGINEER considers it necessary or advisable that covered WORK be observed by the ENGINEER or inspected or tested by others, the CONTRACTOR, at the ENGINEER's request shall uncover, expose, or otherwise make available for observation, inspection, or testing as the ENGINEER may require, that portion of the WORK in question, furnishing all necessary labor, material, and equipment. If it is found that such work is Defective Work, the CONTRACTOR shall bear all direct, indirect, and consequential costs and damages of such uncovering, exposure, observation, inspection, and testing and of satisfactory reconstruction, including but not limited to, fees and charges of engineers, architects, attorneys, and other professionals. However, if such work is not found to be Defective Work, the CONTRACTOR will be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, and reconstruction; and, if the parties are unable to agree as to the amount or extent thereof, the CONTRACTOR may make a claim therefor as provided in Articles 11 and 12.

I. No acceptance of equipment, materials, or work shall be construed to result from such inspections by the ENGINEER. Any inspections or tests or waivers thereof shall not relieve the CONTRACTOR of its responsibility for meeting the requirement of the Contract.

13.4 CITY MAY STOP THE WORK

A. If Defective Work is identified, the ENGINEER may order the CONTRACTOR to stop performance of the WORK, or any portion thereof, until the cause for such order has been eliminated; however, this right of the ENGINEER to stop the WORK shall not give rise to any duty on the part of the ENGINEER to exercise this right for the benefit of the CONTRACTOR or any other party.

13.5 CORRECTION OR REMOVAL OF DEFECTIVE WORK

A. If required by the ENGINEER, the CONTRACTOR shall promptly either correct all Defective Work, whether or not fabricated, installed, or completed, or, if the work has been rejected by the ENGINEER, remove it from the Site and replace it with non-defective WORK. The CONTRACTOR shall bear all direct, indirect, and consequential costs and damages of such correction or removal, including but not limited to fees and charges of engineers, architects, attorneys, and other professionals made necessary thereby.

13.6 ACCEPTANCE OF DEFECTIVE WORK

A. If, instead of requiring correction or removal and replacement of Defective Work, the CITY prefers to accept the Defective Work, the CITY may do so. The CONTRACTOR shall bear all direct, indirect, and consequential costs attributable to the CITY's evaluation of and determination to accept such Defective Work. If any such acceptance occurs prior to final payment, a Change Order will be issued

incorporating the necessary revisions in the Contract Documents with respect to the WORK, and the CITY shall be entitled to an appropriate decrease in the Contract Price.

13.7 CITY MAY CORRECT DEFECTIVE WORK

A. If the CONTRACTOR fails within a reasonable time after written notice from the ENGINEER to correct Defective Work, or to remove and replace Defective Work as required by the ENGINEER in accordance with Paragraph 13.5A., or if the CONTRACTOR fails to perform the WORK in accordance with the Contract Documents, or if the CONTRACTOR fails to comply with any other provision of the Contract Documents, the CITY may, after seven days written notice to the CONTRACTOR, correct and remedy any such deficiency.

B. In exercising the rights and remedies under this paragraph, the CITY shall proceed with corrective and remedial action. In connection with such corrective and remedial action, the CITY may exclude the CONTRACTOR from all or part of the Site, take possession of all or part of the WORK, and suspend the CONTRACTOR's services related thereto and incorporate in the WORK all materials and equipment for which the CITY has paid the CONTRACTOR whether stored at the Site or elsewhere. The CONTRACTOR shall provide the CITY and its ENGINEER, access to the Site to enable CITY to exercise the rights and remedies under this paragraph.

C. All direct, indirect, and consequential cost and damages incurred by the CITY in exercising the rights and remedies under this paragraph will be charged against the CONTRACTOR and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the WORK; and the CITY shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, the CITY may make a claim therefor as provided in Article 11. Such claim will include, but not be limited to, all costs of repair or replacement of work of others, destroyed or damaged by correction, removal, or replacement of CONTRACTOR's Defective Work and all direct, indirect, and consequential damages associated therewith.

D. The CONTRACTOR shall not be allowed an extension of Contract Times (or Milestones) because of any delay in the performance of the WORK attributable to the exercise by CITY of CITY's rights and remedies under this paragraph.

13.8 CORRECTION PERIOD

A. The correction period for Defective Work shall be the longer of:

1. One year after the date of final acceptance;

2. Such time as may be prescribed by Laws and Regulations;

3. Such time as specified by the terms of any applicable special guarantee required by the Contract Documents; or

4. Such time as specified by any specific provision of the Contract Documents.

B. If, during the correction period as defined in Paragraph 13.8A above, any work is found to be Defective Work, the CITY shall have the same remedies as set forth in Paragraphs 13.5, 13.6, and 3.7 above.

C. Where Defective Work (and damage to other work resulting therefrom) has been corrected, removed, or replaced under this paragraph, the correction period hereunder with respect to such work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.1 SCHEDULE OF VALUES (LUMP SUM PRICE BREAKDOWN)

A. The schedule of values or lump sum price breakdown established as provided in the General Requirements shall serve as the basis for progress payments and shall be incorporated into a form of "Application for Payment acceptable to the ENGINEER.

14.2 UNIT PRICE BID SCHEDULE

A. Progress payments on account of unit price work will be based on the number of units completed.

14.3 APPLICATION FOR PROGRESS PAYMENT

A. Unless otherwise prescribed by law, on the 25th of each month, the CONTRACTOR shall submit to the ENGINEER for review, the Application for Payment filled out and signed by the CONTRACTOR covering the WORK completed as of the Application for Payment and accompanied by such supporting documentation as is required by the Contract Documents.

B. The Application for Payment shall identify, as a subtotal, the amount of the CONTRACTOR total earnings to date; plus the value of materials stored at the Site which have not yet been incorporated in the WORK; and less a deductive adjustment for materials installed which were not previously incorporated in the WORK, but for which payment was allowed under the provisions for payment for materials stored at the Site, but not yet incorporated in the WORK.

C. The net payment due the CONTRACTOR shall be the above-mentioned subtotal from which shall be deducted the amount of retainage specified in the Supplementary General Conditions and the total amount of all previous payments made to the CONTRACTOR.

D. The value of materials stored at the Site shall be an amount equal to the specified percent of the value of such materials as set forth in any Supplementary General Conditions. Said amount shall be based upon the value of all acceptable materials and equipment not incorporated in the WORK but delivered and suitably stored at the Site or at another location agreed to in writing; provided, each such individual item has a value of more than $5,000 and will become a permanent part of he WORK. The Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that the CONTRACTOR has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect the CITY's interest therein, all of which will be satisfactory to the CITY.

E. A ten percent (10%) retention of payment amount shall be held by the CITY from the amount of each Application for Payment.

F. **OPTIONAL:** Partial payments for mobilization/demobilization costs shall be as follows:

1. Thirty-five percent (35%) of the amount bid for mobilization/ demobilization or 1.75 percent of the original Contract Price, whichever is less, shall be paid in each of the first two progress payments.

2. The balance of the amount bid for mobilization/demobilization shall be paid upon completion of all WORK on the project.

14.4 CONTRACTOR'S WARRANTY OF TITLE

A. The CONTRACTOR warrants and guarantees that title to all WORK, materials, and equipment covered by an Application for Payment, whether incorporated in the WORK or not, will pass to the CITY no later than the time of payment, free and clear of all Liens.

14.5 REVIEW OF APPLICATIONS FOR PROGRESS PAYMENT

A. The ENGINEER will, within 7 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the application to the CITY, or return the application to the CONTRACTOR indicating in writing the ENGINEER'S REASONS FOR REFUSING TO RECOMMEND PAYMENT. In the latter case, the CONTRACTOR may make the necessary corrections and resubmit the application. If the ENGINEER still disagrees with a portion of the

application, it will submit the application recommending the undisputed portion of the application to the CITY for payment and provide reasons for recommending non-payment of the disputed amount. Thirty days after presentation of the Application for Payment with the ENGINEER'S recommendation, the amount recommended will (subject to the provisions of Paragraph 14.5B.) become due and when due will be paid by the CITY to the CONTRACTOR.

B. The ENGINEER, in its discretion, may refuse to recommend the whole or any part of any payment. ENGINEER may also refuse to recommend any such payment, or, because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously recommended, to such extent as may be necessary in ENGINEER's opinion to protect CITY from loss because:

1. The work is Defective Work or the completed WORK has been damaged requiring correction or replacement.

2. The Contract Price has been reduced by written amendment or Change Order.

3. The CITY has been required to correct Defective Work or complete WORK in accordance with Paragraph 13.7.

4. ENGINEER has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.1 through 15.4 inclusive.

5. Third party claims filed or reasonable evidence indicating probable filing of such claims; or

6. Failure of the Contractor to make payments properly to subcontractors or for labor, materials, or equipment; or

7. Reasonable evidence that the work cannot be completed for the unpaid balance of the contract sum; or

8. Failure of the Contractor to submit an acceptable construction schedule or failure to update the schedule; or

9. Damage to the City or another contractor; or

10. Reasonable evidence that the work will not be completed within the time provided for in the Contract; or

11. Contractor's failure or inability to obtain or maintain insurance coverage and bonds as required by the Contract throughout the course of the job; or

12. Persistent failure to carry out the work in accordance with the Contract; or

13. Failure to deliver copies of certified payrolls, as specified in Section 17.11, General Conditions.

14. In addition, the City may deduct from any such payments due the Contractor any amounts the City may be currently or in the future authorized to retain pursuant to federal, state, or local laws or regulations, any amounts due the City from the Contractor, and any other amounts which the City is otherwise authorized to retain as specified in Special Provisions.

C. The CITY may refuse to make payment of the full amount recommended by the ENGINEER because:

1. Claims have been made against CITY on account of CONTRACTOR's performance or furnishing of the WORK.

2. Liens have been filed in connection with the WORK, except where CONTRACTOR has delivered a specific Bond satisfactory to CITY to secure the satisfaction and discharge of such Liens.

3. There are other items entitling CITY to set-off against the amount recommended, or

4. CITY has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.5B. through 14.5C and 15.1 through 15.4 inclusive.

The CITY must give the CONTRACTOR immediate written notice stating the reasons for such action and promptly pay the CONTRACTOR the amount so withheld, or any adjustment thereto agreed to by CITY and CONTRACTOR, when CONTRACTOR corrects to CITY's satisfaction the reasons for such action.

14.6 COMPLETION

A. When the CONTRACTOR considers the WORK ready for its intended use, the CONTRACTOR shall notify the ENGINEER in writing that the WORK is complete. The CONTRACTOR shall attach to this request a list of all work items that remain to be completed and a request that the ENGINEER prepare a Notice of Completion. Within a reasonable time thereafter, the CONTRACTOR, and the ENGINEER shall make an inspection of the WORK to determine the status of completion. If the ENGINEER considers the WORK complete, the ENGINEER will prepare and execute and deliver for City Council approval and recordation the Notice of Completion signed by the ENGINEER and CONTRACTOR, which shall fix the date of completion.

14.7 PARTIAL UTILIZATION

A. The CITY shall have the right to utilize or place into service any item of equipment or other usable portion of the WORK prior to completion of the WORK. Whenever the CITY plans to exercise said right, the CONTRACTOR will be notified in writing by the ENGINEER, identifying the specific portion or portions of the WORK to be so utilized or otherwise placed into service.

B. It shall be understood by the CONTRACTOR that until such written notification is issued, all responsibility for care and maintenance of all of the WORK shall be borne by the CONTRACTOR. Upon issuance of said written notice of Partial Utilization, the CITY will accept responsibility for the protection and maintenance of all such items or portions of the WORK described in the written notice.

C. The CONTRACTOR shall retain full responsibility for satisfactory completion of the WORK, regardless of whether a portion thereof has been partially utilized by the CITY prior to completion of the WORK.

14.8 FINAL APPLICATION FOR PAYMENT

A. After the CONTRACTOR has completed all of the remaining work items referred to in Paragraph 14.6 and delivered all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of inspection, marked-up record documents (as provided in the General Requirements), and other documents, all as required by the Contract Documents, and after the ENGINEER has indicated that the WORK is acceptable, the CONTRACTOR may make application for final payment following the procedure for progress payments. The final Application for Payment shall be accompanied by all documentation called for in the Contract Documents, together with complete and legally effective releases or waivers (satisfactory to the CITY) of all Liens arising out of or filed in connection with the WORK.

14.9 FINAL PAYMENT AND ACCEPTANCE

A. If, on the basis of the ENGINEER's observation of the WORK during construction and final inspection, and the ENGINEER's review of the final Application for Payment and accompanying documentation, all as required by the Contract Documents, the ENGINEER is satisfied that the WORK has been completed and the CONTRACTOR's other obligations under the Contract Documents have been fulfilled, the ENGINEER will, within 14 days after receipt of the final Application for Payment, indicate in writing the ENGINEER's recommendation of payment and present the application to the CITY for payment.

B. After acceptance of the WORK by the City Council, the CITY will make final payment to the CONTRACTOR of the amount remaining after deducting all prior

payments and all amounts to be kept or retained under the provisions of the Contract Documents, including the following items:

1. Liquidated damages, as applicable;

2. Amounts withheld by CITY under Paragraph 14.5B. and C. which have not been released; and

3. In accordance with Section 17.6, one-and-one-half times the value of outstanding items of correction work or punch list items yet uncompleted or uncorrected, as applicable. All such work shall be completed or corrected to the satisfaction of the ENGINEER as required by the Contract Documents, otherwise the CONTRACTOR does hereby waive any and all claims to all monies withheld by the CITY to cover the value of all such uncompleted or uncorrected items.

C. Prior to final payment by the CITY, the CONTRACTOR must provide the CITY a fully-executed Conditional Waiver and Release Upon Final Payment in accordance with California Civil Code Section 3262.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.1 SUSPENSION OF WORK BY CITY

A. The CITY may, at any time and without cause, suspend the WORK or any portion thereof for a period of not more than 90 days by notice in writing to the CONTRACTOR. The CONTRACTOR shall resume the WORK on receipt of a notice of resumption of work. The CONTRACTOR will be allowed an increase in the Contract Price or an extension of the Contract Time, or both directly attributable to any suspension if the CONTRACTOR makes an approval claim therefor as provided in Articles 11 and 12.

15.2 TERMINATION OF AGREEMENT BY ENGINEER FOR DEFAULT

A. In the event of default by the CONTRACTOR, the ENGINEER may give seven days written notice to the CONTRACTOR and the CONTRACTOR's surety of CITY's intent to terminate the Agreement and provide the CONTRACTOR an opportunity to remedy the conditions constituting the default within a specified period of time. It will be considered a default by the CONTRACTOR whenever CONTRACTOR shall:

1. Declare bankruptcy, become insolvent, or assign its assets for the benefit of its creditors;

2. Disregard or violate the Laws or Regulations of any public body having jurisdiction;

3. Fail to provide materials or workmanship meeting the requirements of the Contract Documents;

4. Disregard or violate provisions of the Contract Documents or ENGINEER's instructions;

5. Fail to prosecute the WORK according to the approved progress schedule;

6. Fail to provide a qualified superintendent, competent workmen, or materials or equipment meeting the requirements of the Contract Documents;

7. Disregard the authority of the ENGINEER; or

8. Assign or subcontract any part of the work without the ENGINEER's consent.

B. If the CONTRACTOR fails to remedy the conditions constituting default within the time allowed, the ENGINEER may then issue the notice of termination.

C. In the event the Agreement is terminated in accordance with Paragraph 15.2A., herein, the CITY may take possession of the WORK and may complete the WORK by whatever method or means the CITY may select. The cost of completing the WORK will be deducted from the balance which would have been due the CONTRACTOR had the Agreement not been terminated and the WORK completed in accordance with the Contract Documents. If such cost exceeds the balance which would have been due, the CONTRACTOR shall pay the excess amount to the CITY. If such cost is less than the balance which would have been due, the CONTRACTOR shall not have claim to the difference.

15.3 TERMINATION OF AGREEMENT BY CITY FOR CONVENIENCE

A. Upon seven days' written notice to the CONTRACTOR, the CITY may, without cause and without prejudice to any other right or remedy of the CITY, elect to terminate the Agreement. In such case, the CONTRACTOR shall be paid (without duplication of any items):

1. For completed and acceptable WORK executed in accordance with the Contract Documents, prior to the effective date of termination, including fair and reasonable sums for overhead and profit of such WORK;

2. For expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted WORK, plus fair and reasonable sums or overhead and profit on such expenses;

3. For all reasonable claims, costs, losses, and damages incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and

4. For reasonable expenses directly attributable to termination.

CONTRACTOR shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.4 TERMINATION OF AGREEMENT BY CONTRACTOR

A. The CONTRACTOR may terminate the Agreement upon 14 days written notice to the ENGINEER whenever:

1. The WORK has been suspended under the provisions of Paragraph 15.1, herein, for more than 90 consecutive days through no fault or negligence of the CONTRACTOR, and notice to resume work or to terminate the Agreement has not been received from the ENGINEER within this time period; or

2. The CITY should fail to pay the CONTRACTOR any monies due him in accordance with the terms of the Contract Documents and within 60 days after presentation to the ENGINEER by the CONTRACTOR of a request therefor, unless within said 14-day period the CITY shall have remedied the condition upon which the payment delay was based.

B. In the event of such termination, the CONTRACTOR shall have no claims against the CITY except for those claims specifically enumerated n Paragraph 15.3, herein, and as determined in accordance with the requirements of said paragraph.

ARTICLE 16 – GENERAL TERMS

16.1 GIVING NOTICE

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

16.2 TITLE TO MATERIALS FOUND ON THE WORK

A. The CITY reserves the right to retain title to all soils, stone, sand, gravel, and other materials developed and obtained from excavations and other operations connected with the WORK. Unless otherwise specified in the Contract Documents, neither the CONTRACTOR nor any Subcontractor shall have any right, title, or interest in or to any such materials. The CONTRACTOR will be permitted to use in the WORK, without charge, any such materials which meet the requirements of the Contract Documents.

16.3 RIGHT TO AUDIT

A. If the CONTRACTOR submits a claim to the ENGINEER for additional compensation, the CITY shall have the right, as a condition to considering the claim, and as a basis for evaluation of the claim, and until the claim has been settled, to audit the CONTRACTOR's books to the extent they are relevant. This right shall include the right to examine books, records, documents, and other evidence and accounting procedures and practices, sufficient to discovery and verify all direct and indirect costs of whatever nature claimed to have been incurred or anticipated to be incurred and for which the claim has been submitted. The right to audit shall include the right to inspect the CONTRACTOR's plant or such parts thereof, as may be or have been engaged in the performance of the WORK. The CONTRACTOR further agrees that the right to audit encompasses all subcontracts and is binding upon Subcontractors. The rights to examine and inspect herein provided for shall be exercisable through such representatives as the CITY deems desirable during the CONTRACTOR's normal business hours at the office of the

CONTRACTOR. The CONTRACTOR shall make available to the ENGINEER for auditing, all relevant accounting records and documents, and other financial data, and upon request, shall submit true copies of requested records to the ENGINEER.

16.4 SURVIVAL OF OBLIGATIONS

A. All representations, indemnifications, warranties, and guaranties made in, required by or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion and acceptance of the WORK or termination or completion of the Agreement.

16.5 CONTROLLING LAW

A. This Agreement is to be governed by the law of the state in which the Project is located.

16.6 SEVERABILITY

A. If any term or provision of this Agreement is declared invalid or unenforceable by any court of lawful jurisdiction, the remaining terms and provisions of the Agreement shall not be affected thereby and shall remain in full force and effect.

16.7 WAIVER

A. The waiver by the CITY of any breach or violation of any term, covenant or condition of this Agreement or of any provision, ordinance, or law shall not be deemed to be a waiver of any other term, covenant, condition, ordinance, or law or of any subsequent breach or violation of the same or of any other term, covenant, condition, ordinance, or law. The subsequent payment of any monies or fee by the CITY which may become due hereunder shall not be deemed to be a waiver of any preceding breach or violation by CONTRACTOR or any term, covenant, condition of this Agreement or of any applicable law or ordinance.

ARTICLE 17 – CALIFORNIA STATE REQUIREMENTS

17.1 STATE WAGE DETERMINATIONS

A. As required by Section 1770 and following, of the California Labor Code, the CONTRACTOR shall pay not less than the prevailing rate of per diem wages as determined by the Director of the California Department of Industrial Relations. Copies of such prevailing rate of per diem wages available file at the office of the City Clerk, which copies shall be made available to any interested party on request. The CONTRACTOR shall post a copy of such determination at each job site.

B. In accordance with Section 1775 of the California Labor Code, the CONTRACTOR shall, as a penalty to the CITY, forfeit not more than **$200.00** for each calendar day or portion thereof, for each worker paid less than the prevailing rates as determined by the Director for the work or craft in which the worker is employed for any public work done under the contract by him or her or by any subcontractor under him or her.

17.2 WORKERS' COMPENSATION

A. In accordance with the provisions of Section 3700 of the California Labor Code, the CONTRACTOR shall secure the payment of compensation to its employees.

B. Prior to beginning work under the Contract, the CONTRACTOR shall sign and file with the ENGINEER the following certification:

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

C. Notwithstanding the foregoing provisions, before the Contract is executed on behalf of the CITY, a bidder to whom a contract has been awarded shall furnish satisfactory evidence that it has secured in the manner required and provided by law the payment of workers' compensation.

17.3 APPRENTICES ON PUBLIC WORKS

A. The CONTRACTOR shall comply with all applicable provisions of Section 1777.5 of the California Labor Code relating to employment of apprentices on public works.

17.4 WORKING HOURS

A. The CONTRACTOR shall comply with all applicable provisions of Section 1810 to 1815, inclusive, of the California Labor Code relating to working hours. The CONTRACTOR shall, as a penalty to the CITY, forfeit $25.00 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 8 hours in any one calendar day and 40 hours in any one calendar week, unless such worker receives compensation for all hours worked in excess of 8 hours at not less than 1-1/2 times the basic rate of pay.

17.5 CONTRACTOR NOT RESPONSIBLE FOR DAMAGE RESULTING FROM CERTAIN ACTS OF GOD

A. As provided in Section 7105 of the California Public Contract Code, the CONTRACTOR shall not be responsible for the cost of repairing or restoring damage to the WORK which damage is determined to have been proximately caused by an act of God, in excess of 5 percent of the contracted amount, provided, that the WORK damaged was built in accordance with accepted and applicable building standards and the plans and specifications of the CITY. The CONTRACTOR shall obtain insurance to indemnify the CITY for any damage to the WORK caused by an act of God if the insurance premium is a separate bid item in the bidding schedule for the WORK. For purposes of this Section, the term "acts of God" shall include only the following occurrences or conditions and effects: earthquakes in excess of a magnitude of 3.5 on the Richter Scale and tidal waves.

17.6 NOTICE OF COMPLETION

A. In accordance with the Sections 3086 and 3093 of the California Civil Code, within 10 days after date of acceptance of the WORK BY THE City Council the ENGINEER will file, in the County Recorder's office, a Notice of Completion of the WORK.

17.7 UNPAID CLAIMS

A. If, at any time prior to the expiration of the period for service of a stop notice, there is served upon the CITY a stop notice as provided in Sections 3179 and 3210 of the California Civil Code, the CITY shall, until the discharge thereof, withhold from the monies under its control so much of said monies due or to become due to the CONTRACTOR under this Contract as shall be sufficient to answer the claim stated in such stop notice and to provide for the reasonable cost of any litigation thereunder; provided, that if the ENGINEER shall, in its discretion, permit CONTRACTOR to file with the ENGINEER the bond referred to in Section 3196 of the Civil Code of the State of California, said monies shall not thereafter be withheld on account of such stop notice.

17.8 RETAINAGE FROM MONTHLY PAYMENTS

A. Pursuant to Section 22300 of the California Public Contract Code, the CONTRACTOR may substitute securities for any money withheld by the CITY to insure performance under the Contract. At the request and expense of the CONTRACTOR, securities equivalent to the amount withheld shall be deposited with the CITY or with a state or federally chartered bank in California as to the escrow agent, who shall return such securities to the CONTRACTOR upon satisfactory completion of the Contract.

B. Alternatively, the CONTRACTOR may request and the CITY shall make payment of retentions earned directly to the escrow agent at the expense of the CONTRACTOR. At the expense of the CONTRACTOR, the CONTRACTOR may direct the investment of the payments into securities and the CONTRACTOR shall receive the interest earned on the investments upon the same terms provided in Section 22300 of the Public Contract Code securities deposited by the CONTRACTOR. The CONTRACTOR shall be responsible for paying all fees for the expenses incurred by the escrow agent in administering the escrow account and all expenses of the CITY. These expenses and payment terms shall be determined by the CITY's Finance Director or his/her designee and the escrow agent. Upon satisfactory completion of the Contract, the CONTRACTOR shall receive from the escrow agent all securities, interest, and payments received by the escrow agent from the CITY, pursuant to the terms of Section 22300 of the Public Contract Code. The CONTRACTOR shall pay to each subcontractor, not later than 20 days of receipt of the payment, the respective amount of interest earned, net of costs attributed to retention withheld from each subcontractor, on the amount of retention withheld to insure the performance of the CONTRACTOR.

C. Securities eligible for investment under Section 22300 shall be limited to those listed in Section 16430 of the Government Code and to bank or savings and loan certificates of deposit, interest bearing demand deposit accounts, standby letters of credit, or any other security mutually agreed to by the CONTRACTOR and the CITY.

17.9 PUBLIC WORKS CONTRACTS; ASSIGNMENT TO AWARDING BODY

A. In accordance with Section 7103.5 of the California Public Contract Code, the CONTRACTOR and Subcontractors shall conform to the following requirements. In entering into a public works contract or a subcontract to supply goods, services, or materials pursuant to a public works contract, the CONTRACTOR or subcontractor offers and agrees to assign to the CITY 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. 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, services, or materials pursuant to the public works contract or the subcontract. This assignment shall be made and become effective at the time

the awarding body tenders final payment to the CONTRACTOR, without further acknowledgment by the parties.

17.10 PAYROLL RECORDS; RETENTION; INSPECTION; NONCOMPLIANCE PENALTIES; RULES AND REGULATIONS

A. In accordance with Section 1776 of the California Labor Code 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 by him or her in connection with the public work. Each payroll record shall contain or be verified by a written declaration that it is made under penalty of perjury, stating both of the following:

1. The information contained in the payroll record is true and correct.

2. The employer has complied with the requirements of Sections 1771, 1811, and 1815 for any work performed by his or her employees on the public works project.

B. The payroll records shall be certified and shall be available for inspection at all reasonable hours at the principal office of the CONTRACTOR on the following basis:

1. A certified copy of an employee's payroll record shall be made available for inspection or furnished to the employee or his or her authorized representative on request as well as submitted electronically online to the Department of Industrial Relations Labor Commissioner: https://apps.dir.ca.gov/ecpr/DAS/AltLogin.

2. A certified copy of all payroll records shall be made available for inspection or furnished upon request to a representative of the body awarding the contract, the Division of Labor Standards Enforcement, and the Division of Apprenticeship Standards of the Department of Industrial Relations.

3. A certified copy of all payroll records shall be made available upon request by the public for inspection or copies thereof made; provided, however, that a request by the public shall be made through either the body awarding the contract, the Division of Apprenticeship Standards, or the Division of Labor Standards Enforcement. If the requested payroll records have not been provided the requesting party shall, prior to being provided the records, reimburse the costs of preparation by the CONTRACTOR, Subcontractors, and the entity through which the request was made. The public shall not be given access to the records at the principal office of the CONTRACTOR.

C. The certified payroll records shall be on forms provided by the Division of Labor Standards Enforcement or shall contain the same information as the forms provided by the division.

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

E. The CONTRACTOR shall inform the ENGINEER of the location of the records including the street address, city and county, and shall, within 5 working days, provide a notice of change of location and address.

F. The CONTRACTOR shall have 10 days in which to comply subsequent to receipt of written notice specifying in what respects the CONTRACTOR must comply with this Section. In the event that the CONTRACTOR fails to comply within the 10-day period, he or she shall, as a penalty to the state or political subdivision on whose behalf the contract is made or awarded, forfeit twenty-five dollars ($25.00) for each calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement, these penalties shall be withheld from progress payments then due. A contractor is not subject to a penalty assessment pursuant to this section due to the failure of a subcontractor to comply with this section.

17.11 CULTURAL RESOURCES

A. The CONTRACTOR's attention is directed to the provisions of the Clean Water Grant Program Bulletin 76A which augments the National Historic Preservation Act of 1966 (16 U.S.C. 470) as specified under Section 01560 - Temporary Environmental Controls, of the General Requirements.

17.12 PROTECTION OF WORKERS IN TRENCH EXCAVATIONS

A. As required by Section 6705 of the California Labor Code and in addition thereto, whenever work under the Contract involves the excavation of any trench or trenches 5 feet or more in depth, the CONTRACTOR shall submit for acceptance by the ENGINEER, to whom authority to accept has been delegated, in advance of excavation, a detailed plan showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation, of such trench or trenches. If such plan varies from the shoring system standards established by the Construction Safety Orders of the Division of Occupational Safety and Health, the plan shall be prepared by a

registered civil or structural engineer employed by the CONTRACTOR, and all costs therefore shall be included in the price named in the Contract for completion of the WORK as set forth in the Contract Documents. Nothing in this Section shall be deemed to allow the use of a shoring, sloping, or other protective system less effective than that required by the Construction Safety Orders. Nothing in this Section shall be construed to impose tort liability on the CITY or any of its officers, agents, representatives, or employees.

B. Excavation shall not start until the CONTRACTOR has obtained a permit from the California Division of Industrial Safety and has posted it at the site.

17.13 CONCRETE FORMS, FALSEWORK, AND SHORING

A. The CONTRACTOR shall comply fully with the requirements of Section 1717 of the Construction Safety Orders, State of California, Department of Industrial Relations, regarding the design of concrete forms, falsework and shoring, and the inspection of same prior to placement of concrete. Where the said Section 1717 requires the services of a civil engineer registered in the State of California to approve design calculations and working drawings of the falsework or shoring system, or to inspect such system prior to placement of concrete, the CONTRACTOR shall employ a registered civil engineer for these purposes, and all costs therefore shall be included in the price named in the Contract for completion of the WORK as set forth in the Contract Documents.

17.14 REMOVAL, RELOCATION, OR PROTECTION OF EXISTING UTILITIES

A. In accordance with the provisions with the provisions of Section 4215 of the California Government Code, the CITY shall assume the responsibility for the timely removal, relocation, or protection of existing main or trunkline utility facilities located on the site of any construction project that is a subject of the Contract, if such utilities are not identified by the CITY in the plans and specifications made a part of the invitation for bids. The CITY will compensate CONTRACTOR for the costs of locating, repairing damage not due to the failure of the CONTRACTOR to exercise reasonable care, and removing or relocating such utility facilities not indicated in the plans and specifications with reasonable accuracy, and for equipment on the project necessarily idled during such work.

B. The CONTRACTOR shall not be assessed liquidated damages for delay in completion of the project, when such delay was caused by the failure of the public agency or the owner of the utility to provide for removal or relocation of such utility facilities.

C. Nothing herein shall be deemed to require the public agency to indicate the presence of existing service laterals or appurtenances when the presence of such utilities on the site of the construction project can be inferred from the presence of other visible facilities, such as buildings, meter and junction boxes, on or adjacent to the site of

construction; provided however, nothing herein shall relieve the public agency from identifying main or trunklines in the plans and specifications.

D. If the CONTRACTOR while performing the Contract discovers utility facilities not identified by the public agency in the Contract Documents it shall immediately notify the public agency and utility in writing.

E. The public utility, where they are the owner, shall have the sole discretion to perform such repairs or relocation work or permit the CONTRACTOR to do such repairs or relocation work at a reasonable price.

17.15 CONTRACTOR LICENSE REQUIREMENTS

A. In accordance with Section 7028.15 of the California Business and Professions Code:

B. It is a misdemeanor for any person to submit a bid to a public agency in order to engage in the business or act in the capacity of a contractor within this state without having a license therefor, except in any of the following cases:

1. The person is particularly exempted from this chapter.

2. The bid is submitted on a state project governed by Section 10164 of the Public Contract Code or any local agency project governed by Section 20103.5 of the Public Contract Code.

C. If a person has previously been convicted of the offense described in this section, the court shall impose a fine of 20 percent of the price of the contract under which the unlicensed person performed contract work, or four thousand five hundred dollars ($4,500), whichever is greater, or imprisonment in the county jail for not less than 10 days nor more than six months, or both.

D. In the event the person performing the contracting work has agreed to furnish materials and labor on an hourly basis, “the price of the contract” for the purpose of this subdivision means the aggregate sum of the cost of materials and labor furnished and the cost of completing the work to be performed.

E. This section shall not apply to a joint venture license, as required by Section 7029.1 of the California Business and Professions Code. However, at the time of making a bid as a joint venture, each person submitting the bid shall be subject to this section with respect to his or her individual licensure.

F. This section shall not affect the right or ability of a licensed architect, land surveyor, or registered professional engineer to form joint ventures with licensed contractors to render services within the scope of their respective practices.

G. Unless one of the foregoing exceptions applies, a bid submitted to a public agency by a contractor who is not licensed in accordance with this chapter shall be considered nonresponsive and shall be rejected by the public agency. Unless one of the foregoing exceptions applies, a local public agency shall, before awarding a contract or issuing a purchase order, verify that the contractor was properly licensed when the contractor submitted the bid. Notwithstanding any other provision of law, unless one of the foregoing exceptions applies, the registrar may issue a citation to any public officer or employee of a public entity who knowingly awards a contract or issues a purchase order to a contractor who is not licensed pursuant to this chapter. The amount of civil penalties, appeal, and finality of such citations shall be subject to Sections 7028.7 and 7028.13 inclusive of the California Business and Professions Code. Any contract awarded to, or any purchase order issued to, a contractor who is not licensed pursuant to this chapter is void.

H. Any compliance or noncompliance with subdivision (G) of this paragraph shall not invalidate any contract or bid awarded by a public agency during which time that subdivision was in effect.

I. A public employee or officer shall not be subject to a citation pursuant to this section if the public employee, officer, or employing agency mad an inquiry to the board for the purposes of verifying the license status of any person or contractor and the board failed to respond to the inquiry within three business days. For the purposes of this section, a telephone response by the board s hall be deemed sufficient.

17.16 DIGGING TRENCHES OR EXCAVATIONS; NOTICE ON DISCOVERY OF HAZARDOUS WASTE OR OTHER UNUSUAL CONDITIONS; INVESTIGATIONS; CHANGE ORDERS; EFFECT ON CONTRACT

A. If this Contract involves digging trenches or other excavations that extend deeper than four feet below the surface, the following shall apply:

1. The CONTRACTOR shall promptly, and before the following conditions are disturbed, notify the ENGINEER in writing, of any:

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

b. Subsurface or latent physical conditions at the site differing from those indicated.

c. Unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally

recognized as inherent in work of the character provided for in the contract.

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

e. In the event that a dispute arises between the ENGINEER and the CONTRACTOR whether the conditions materially differ, or involve hazardous waste, or cause a decrease or increase in the CONTRACTOR'S cost of, or time required for, performance of any part of the work, the CONTRACTOR shall not be excused from any scheduled completion date provided for by the Contract, but shall proceed with all work to be performed under the Contract. The CONTRACTOR shall retain any and all rights provided either by contract or by law which pertain to the resolution of disputes and protests between the contracting parties.

17.17 RETENTION PROCEEDS; WITHHOLDING; DISBURSEMENT

A. In accordance with Section 7107 of the Public Contract Code with respects to all contracts entered into on or after January 1, 1993 relating to the construction of any public work of improvement the following shall apply:

1. The retention proceeds withheld from any payment by the CITY from the original CONTRACTOR, or by the original CONTRACTOR from any subcontractor, shall be subject to this paragraph 17.18.

2. Within 60 days after the date of completion of the WORK, including any punch-list WORK, the retention withheld by the CITY shall be released. In the event of a dispute between the ENGINEER and the original CONTRACTOR, the CITY may withhold from the final payment an amount not to exceed 150 percent of the disputed amount. For the purposes of this paragraph, "completion" means any of the following:

a. The occupation, beneficial use, and enjoyment of a work of improvement, excluding any operation only for testing, startup, or commissioning, by the CITY, accompanied by cessation of labor on the work of improvement.

b. The acceptance by the City Council of the work of improvement.

c. After the commencement of a work of improvement, a cessation of labor on the work of improvement for a continuous period of 100 days or more, due to factors beyond the control of the CONTRACTOR.

d. After the commencement of a work of improvement, a cessation of labor on the work of improvement for a continuous period of 30 days or more, if the ENGINEER files for record a notice of cessation or a notice of completion.

3. Subject to subparagraph 17.18 A.4, within 10 days from the time that all or any portion of the retention proceeds are received by the original CONTRACTOR, the original CONTRACTOR shall pay each of its subcontractors from whom retention has been withheld, each subcontractor's share of the retention received. However, if a retention payment received by the original CONTRACTOR is specifically designated for a particular subcontractor, payment of the retention shall be made to the designated subcontractor, if the payment is consistent with the terms of the subcontract.

4. The original CONTRACTOR may withhold from a subcontractor its portion of the retention proceeds if a bona fide dispute exists between the subcontractor and the original CONTRACTOR. The amount withheld from the retention payment shall not exceed 150 percent of the estimated value of the disputed amount.

5. In the event that retention payments are not made within the time periods required by this paragraph 17.18, the CITY or original CONTRACTOR shall be subject to a charge of 2 percent per month on the improperly withheld amount, in lieu of any interest otherwise due. Additionally, in any action for the collection of funds wrongfully withheld, the prevailing party shall be entitled to attorney's fees and costs.

6. Any attempted waiver of the provisions of this section shall be void as against the public policy of this state.

17.18 TIMELY PROGRESS PAYMENTS; INTEREST; PAYMENT REQUESTS

A. If the CITY fails to make any progress payment within 30 days after receipt of an undisputed and properly submitted payment request from the CONTRACTOR, the

CITY shall pay interest to the CONTRACTOR equivalent to the legal rate set forth in subdivision (a) of Section 685.010 of the Code of Civil Procedure.

B. Upon receipt of a payment request, the ENGINEER shall act in accordance with both of the following:

1. Each payment request shall be reviewed by the ENGINEER as soon as practicable after receipt for the purpose of determining that the payment request is a proper payment request.

2. Any payment request determined not to be a proper payment request suitable for payment shall be returned to the CONTRACTOR as soon as practicable, but not later than seven days, after receipt. A request returned pursuant to this paragraph shall be accompanied by a document setting forth in writing the reasons why the payment request is not proper.

C. The number of days available to the CITY to make a payment without incurring interest pursuant to this paragraph shall be reduced by the number of days by which the CITY exceeds the seven-day requirement set forth above.

D. For purposes of this paragraph:

1. A "progress payment" includes all payments due the CONTRACTOR, except that portion of the final payment designated by the contract as retention earnings.

2. A payment request shall be considered properly executed if funds are available for payment of the payment request, and payments is not delayed due to an audit inquiry by the financial officer of the CITY.

17.19 PREFERENCE FOR MATERIAL

A. In accordance with Section 3400 of the California Public Contract Code, the CONTRACTOR will be provided a period prior to award of the contract for submission of data substantiating a request for a substitution of "as equal" item.

17.20 RESOLUTION OF CONSTRUCTION CLAIMS

A. In accordance with Section 20104 et Seq. of the California Public Contract Code. This paragraph applies to all claims of $375,000 or less which arise between the CONTRACTOR and the CITY under this Contract for:

1. A time extension;

2. Payment of money or damages arising from work done by or on behalf of, the CONTRACTOR pursuant to this CONTRACT and payment of which is not otherwise expressly provided for or the CONTRACTOR is not otherwise entitled to; or

3. An amount the payment of which is disputed by the ENGINEER.

B. For any claim set out in Paragraphs A.1, 2, or 3 above, the following requirements apply:

1. The claim shall be in writing and include the documents necessary to substantiate the claim and be accompanied by the following certification:

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

Claims must be filed on or before the date of final payment. Nothing herein is intended to extend the time limit or supersede notice requirements otherwise provided by Contract for the filing of claims.

The claim must include an actual cost documentation, including hours of work performed, equipment operation costs, and labor and overhead costs, which should be established at a standard percentage. Any overhead costs listed when paid, shall provide full and complete payment for any and all overhead, including jobsite overhead, home office overhead, as well as additional costs arising from disruption, resequencing or acceleration. A notice of POTENTIAL CLAIM shall be submitted in advance of the performance of any work, regardless of type, in which the CONTRACTOR may claim an additional cost. CONTRACTOR shall provide prompt notification of any disagreement in quantities of work performed along with a detailed accounting by means of a schedule update demonstrating any delays incurred.

2. For claims of less than fifty thousand dollars ($50,000), the ENGINEER 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 CITY may have against the CONTRACTOR.

   If additional information is thereafter required, it shall be requested and provided upon mutual agreement of the ENGINEER and the CONTRACTOR.

   The ENGINEER's written response to the claim, as further documented, shall be submitted to the CONTRACTOR within 15 days after receipt of further documentation or within a period of time no greater than that taken by the CONTRACTOR in producing the additional information, whichever is greater.

3. For claims of over fifty thousand dollars ($50,000) and less than or equal to three hundred seventy-five thousand dollars ($375,000), the ENGINEER 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 CITY may have against the CONTRACTOR.

   If additional information is thereafter required, it shall be requested and provided upon mutual agreement of the ENGINEER and the CONTRACTOR.

   The ENGINEER's written response to the claim, as further documented, shall be submitted to CONTRACTOR within 30 days after receipt of the

further documentation, or within a period of time no greater than that taken by the CONTRACTOR in producing the additional information or requested documentation, whichever is greater.

4. If the CONTRACTOR disputes the ENGINEER's written response, or the ENGINEER fails to respond within the time prescribed, the CONTRACTOR may notify the ENGINEER, in writing, either within 15 days of receipt of the ENGINEER's response or within 15 days of the ENGINEER's failure to respond within the time prescribed, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon a demand, the ENGINEER shall schedule a meet and confer conference within 30 days for settlement of the dispute.

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

C. The following procedures are established for all civil actions filed to resolve claims subject to this article:

1. Within 60 days, but no earlier than 30 days, following the filing or responsive pleadings, the court shall submit the matter to nonbinding mediation unless waived by mutual stipulation of both parties. The mediation process shall provide for the selection within 15 days by both parties of a disinterested third person as mediator, shall be commenced within 30 days of the submittal, and shall be concluded within 15 days from the commencement of the mediation unless a time requirement is extended upon a good cause showing to the court or by stipulation of both parties. If the parties fail to select a mediator within the 15-day period, any party may petition the court to appoint the mediator.

2. If the matter remains in dispute, the case shall be submitted to judicial arbitration pursuant to Chapter 2.5 (commencing with Section 1141.10) of Title 3 of Part 3 of the Code of Civil Procedure, notwithstanding Section 1141.11 of that code. The Civil Discovery Act of 1986 (Article 3 (commencing with Section 2016) of Chapter 3 of Title 3 of Part 4 of the Code of Civil Procedure) shall apply to any proceeding brought under this subdivision consistent with the rules pertaining to judicial arbitration.

Notwithstanding any other provision of law, upon stipulation of the parties, arbitrators appointed for purposes of Article 1.5 of Chapter 1 of Part 3 of Division 2 of the California Public Contract Code shall be experienced in construction law, and, upon stipulation of the parties, mediators and arbitrators shall be paid necessary and reasonable hourly rates of pay not to exceed their customary rate, and such fees and expenses shall be paid equally by the parties, except in the case of arbitration where the arbitrator, for good cause, determines a different division. In no event shall these fees or expenses be paid by state or county funds.

In addition to Chapter 2.5 (commencing with Section 1141.10 of Title 3 of Part 3 of the Code of Civil Procedure any party who after receiving an arbitration award requests a trial de novo but does not obtain a more favorable judgment shall, in addition to payment of costs and fees under that chapter, also pay the attorney's fees of the other party arising out of the trial de novo .

3. The CITY shall not fail to pay money as to any portion of a claim which is undisputed except as otherwise provided in this Contract.

4. In any suit filed under Section 20104.4 of the California Public Contract Code, the CITY shall pay interest at the legal rate on any arbitration award or judgment. The interest shall begin to accrue on the date the suit is filed in a court of law.

END OF GENERAL CONDITIONS

file name:

SECTION III

SPECIAL PROVISIONS

SECTION III

SPECIAL PROVISIONS

PART 1 GENERAL

3-1 SPECIAL PROVISION NOTES – Unless otherwise noted, adherance to the special provisions, shall not be grounds for additional payment to the contractor. All costs shall be considered included in the contract bid schedule provided at the time of bidding.

3-2. SUMMARY OF WORK – The project work includes but is not limited to the following:

Relocating the primary sodium hypochlorite storage and feed to the main dosing point adjacent to the Wetland Effluent Pump Station (WEPS). This will include a shelter structure to house equipment and all necessary ancillary equipment and components associated with a chemical storage and feed system, which include the following general components: Chemical storage and feed pump containment area and shelter; Three sodium hypochlorite storage tanks; Chemical feed pump skid; Chemical feed piping to the WEPS dosing point; Recycle water (3W) connection; Potable water (1W) connection; Safety shower / eyewash station; Tank fill connections for sodium hypochlorite deliveries; Paved access roadway for chemical deliveries; PLC to monitor and control new components; and Electrical feed from existing and nearby MCC building.

See project plans and technical specifications for more details.

3-3. ORDER OF PRECEDENCE OF CONTRACT DOCUMENTS – If the CONTRACTOR discovers any errors, omissions, discrepancies, or conflicts in the Contract, he/she shall immediately inform the ENGINEER in writing. The ENGINEER will promptly resolve such matters by issuing addenda or change orders, if require. Failure or delay to act on the part of the ENGINEER shall not constitute a waiver of any right afforded the CITY or the ENGINEER by the Contract or constitute an implied approval. Any work affected by such discoveries that is performed by the CONTRACTOR prior to authorization by the CITY shall be at the CONTRACTOR'S risk.

Unless otherwise noted below, conflicts or inconsistencies between parts of the Contract will be resolved by the ENGINEER with a change order or an addendum, if required. Addenda and change orders bearing the most recent date shall prevail over addenda or change orders bearing earlier dates. Any reference to addenda-changed specifications or drawings shall be considered to have been changed accordingly.

In resolving conflicts, errors, or discrepancies, the order of precedence shall be as follows:

1) Change Orders/Addenda (most recent in time takes precedence)
2) Agreement and Bond Forms
3) Special Provisions
4) Technical Specifications

5) Drawings

6) Standard Specifications (in no particular order)

   i. Current Caltrans Standard Specifications

   ii. City Standard Specifications

7) General Conditions

8) Instructions to Bidders

9) CONTRACTOR'S Bid (Bid Form)

10) Notice Inviting Bids

11) Permits from other agencies as may be required by law.

3-4. COOPERATION –

The Ellis Creek Water Recycling Facility is in active and continuous use. CONTRACTOR shall coordinate with operations staff to ensure that timing of changes in the treatment system operations occur with adequate notice and minimized disruption. Detailed sequencing and limitations are included in the technical specifications. The CONTRACTOR shall not prevent the City's ability to operate the Water Recycling Facility. This includes coordination of chemical deliveries, as well as potential discharge activities.

3-5. UTILITIES - The CONTRACTOR shall not adjust any utilities unless otherwise specified in the project plans and specifications, which include but are not limited to: gas, electric, fiber optic, television cable, telephone, Petaluma infrastructure, and Sonoma County infrastructure. The CONTRACTOR will notify each agency who will be in turn responsible to adjust their own structures at least seven (7) working days prior to covering/burying these facilities at no cost to the CITY. Failure to do so shall result in the CONTRACTOR being liable for the utility agencies' claims. If the adjusted utilities will be embedded in the new sidewalk, the new or adjusted utility boxes shall be concrete or as directed by the ENGINEER, and flush with the existing sidewalk. The contractor shall coordinate with the City and utility companies to determine who will provide the concrete boxes, if required.

3-6. IRRIGATION – The CONTRACTOR shall maintain and protect or repair and replace any encountered active irrigation lines. CONTRACTOR shall confirm line is inactive if left abandoned. CONTRACTOR shall immediately notify the ENGINEER of any damaged irrigation lines. This section applies to both potable and recycled water irrigation. If recycled water irrigation is damaged, CONTRACTOR's replacement shall comply with all CITY recycled water irrigation standards.

3-7. OBSTRUCTIONS - Attention is directed to Sections 5-1.36D, "Non-highway Facilities", and 15, "Existing Facilities", of the Standard Specifications and these special provisions.

The CONTRACTOR's attention is directed to the existence of certain underground facilities that may require special precautions be taken by the CONTRACTOR to protect

the health, safety and welfare of workmen and of the public. Facilities requiring special precautions include, but are not limited to: conductors of petroleum products, oxygen, chlorine and toxic or flammable gases; natural gas in pipelines greater than 6 inches in diameter or pipelines operating at pressures greater than 60 psi (gage); underground electric supply system conductors or cables either directly buried or in duct or conduit which do not have concentric neutral conductors or other effectively grounded metal shields or sheaths; and underground electrical conductors with potential to ground of more than 300 volts.

The CONTRACTOR shall notify the ENGINEER and the appropriate regional notification center for operators of subsurface installations at least 5 working days prior to performing any excavation or other work close to any underground pipeline, conduit, duct, wire or other structure. Regional notification centers include but are not limited to the following:

Underground Service Alert
Northern California (USA)
Telephone: 1 (800) 227-2600

If the CONTRACTOR's certain operation is delayed, in the opinion of the ENGINEER, by the discovery of an underground utility not indicated on the plans or not marked by USA, the CONTRACTOR shall be paid a fair and reasonable compensation for the actual loss. Actual loss shall be understood to include no items of expense other than idle time of equipment exclusively used in such operation and necessary payments for idle time of labor exclusively required for such operation only, determined as follows:

1) Compensation for idle equipment shall be applied at the reduced Caltrans' Equipment Rental Rates where the right of way delay factor for each classification of equipment shall be applied to such equipment rental rate. No markup shall be applied for overhead or profit.

2) Compensation for idle time of labor shall be actual wages paid to the workers. No markup shall be added for overhead and profit.

3) The time for which such compensation will be paid will not exceed eight (8) hours for each incident.

4) The CONTRACTOR shall be granted an extension of time for the delay.

5) No monetary compensation will be allowed for delays due to utilities indicated on the plans or marked by USA.

3-8. ORDER OF WORK – The Critical Path Method (CPM) schedule shall be submitted, reviewed, and approved, by the ENGINEER, prior to the start of work. Subsequent deviations or modifications to the ORDER OF WORK shall be submitted for review and approval to the ENGINEER.

3-9. PROJECT SCHEDULE - Except where specifically required by the project technical specifications, all project schedules shall be as outlined below:

The CONTRACTOR shall submit a schedule which includes all major tasks and milestones to the ENGINEER **at least** ten (10) working days prior to start of work.

After beginning of work, updated 6 week look ahead schedules shall be submitted on a weekly basis. No progress payments will be processed without proper schedule updates.

3-10. SUPERINTENDENCE - The CONTRACTOR shall designate in writing and submit to the ENGINEER, at least two (2) full working days prior to starting work, an authorized representative who shall have the authority to represent and act for the CONTRACTOR for the duration of the contract. Any change in this designation shall require prior written approval by the ENGINEER.

When the CONTRACTOR is comprised of two (2) or more persons, firms, partnerships or corporations functioning on a joint venture basis, said CONTRACTOR shall designate in writing before starting work, the name of one authorized representative who shall have the authority to represent and act for the CONTRACTOR.

Superintendent qualifications, at a minimum, shall meet the following:

1. English-speaking
2. 5 years or more of experience performing similar work at or above the level of superintendent
3. Ability to be present onsite at all times during work
4. Contactable 24-hours a day, 7 days a week as required
5. Possesses the knowledge, skills and abilities requisite to carry out the project
6. Single primary point of contact

Determination of qualified experience is at the sole discretion of the CITY. The ENGINEER has the full discretion to revoke superintendence approval at anytime with written notice to the contractor based on unsatisfactory performance. If superintendence is revoked by the ENGINEER, up to 10 additional working days may be provided at the discretion of the ENGINEER.

Backup superintendents can be submitted and pre-approved by the ENGINEER in order to avoid work shutdown due to superintendent absence or revocation due to performance issues. Regardless of the number of backup superintendents, there should only be one primary point of contact for the CONTRACTOR.

Said authorized representative shall be present, at all times, at the site of work, while work is actually in progress on the contract. When work is not in progress and during periods when work is suspended, arrangements acceptable to the ENGINEER shall be made for any emergency work, which may be required.

If work is in progress and the authorized representative is not on site, the City reserves the right to stop the work at no cost to the City.

Once the work begins, the Superintendent shall keep the ENGINEER informed of the CONTRACTOR's daily schedule. The ENGINEER shall have at least twenty-four (24) hour advance notice of all work, on a daily basis, including SUBCONTRACTOR's work. If the CONTRACTOR fails to notify the ENGINEER, the ENGINEER reserves the right to stop the work at no cost to the City.

In the case of urgency or emergency where the superintendent is not present on any particular part of the work and where the ENGINEER wishes to give notification or direction, it will be given to and be obeyed by the foreperson who may have charge of the particular work. Otherwise, notification or direction will be given to and be obeyed by any worker in the area should the superintendent not be immediately available.

All costs involved in superintendence shall be included in the contract prices paid for various items of work and no additional payment will be allowed therefore.

3-11. SAFETY REQUIREMENT - The CONTRACTOR, shall comply with all project specific, statutory, regulatory, City, State, County, and Federal safety requirements. It shall be the CONTRACTOR's sole responsibility for making sure these safety requirements are met and the CONTRACTOR shall fully assume all liabilities for any damages and/or injuries resulting from his or her failure to comply with the safety requirements. Failure on the CITY's part to stop unsafe practices shall, in no way, relieve the CONTRACTOR of his/her responsibility.

The CONTRACTOR shall first call City of Petaluma Emergency Center at 911, from a regular telephone, and (707)-568-5992, if any gas lines or electrical power lines are broken or damaged.

The CONTRACTOR shall immediately notify the CITY of any reportable safety incidents.

3-12. SITE MAINTENANCE – The CONTRACTOR shall maintain a neat and orderly work area. It is the responsibility of the CONTRACTOR to prevent unauthorized access to the construction site and work or staging areas.

When practicable, debris developed during construction shall be disposed of concurrently with its removal. Stockpiling on the street shall not be allowed, unless otherwise allowed in the project specifications. The CONTRACTOR shall apply for a "stockpiling" permit from the City's Community Development Department prior to stockpiling more than fifty (50) cubic yards of materials on private property. The CONTRACTOR shall solely be responsible for securing staging and/or stockpiling areas.

The CONTRACTOR shall provide dust control as often as required during the construction and shall clean the roads/streets with street sweepers at least once a day at the end of each working day or more often if safety or appearance conditions warrant. Failure to maintain dust control, street cleaning and/or any required work specified in this section shall result in the City performing the work with other forces and back charge the CONTRACTOR for the costs.

Full compensation for conforming to the provisions in this section, not otherwise provided for, shall be considered as included in prices paid for the various contract items of work involved and no additional compensation will be allowed therefore.

3-13. RESPONSIBILITY FOR DAMAGE - The CONTRACTOR shall indemnify, hold harmless, release and defend the City of Petaluma, its officers, officials, employees and agents from and against any and all liabilities, claims, demands, losses, damages, expenses, costs (including without limitation costs and fees of litigation) of every nature arising out of or in connection with the activities of the CONTRACTOR, his/her subcontractors, employees and agents, except such loss or damage which was caused by the sole negligence or willful misconduct of the CITY, its employees or agents. The CITY may retain so much of the money due the CONTRACTOR as shall be considered necessary, until disposition has been made of claims or suits for damages as aforesaid.

3-14. GUARANTEE OF WORK - Neither the final certificate of payment nor any provision in the contract nor partial or entire use of the improvements embraced in this contract by the City or the public shall constitute an acceptance of work not done in accordance with the contract or relieve the CONTRACTOR of liability in respect to any warranties or responsibility for faulty materials or workmanship. The CONTRACTOR's attention is directed to Article 5, "Bonds and Insurance", of the General Conditions.

3-15. NOTICE TO PROCEED, BEGINNING OF WORK, CONTRACT TIME, TIME OF COMPLETION, AND LIQUIDATED DAMAGES – Article 2.3, "Commencement of Contract Times; Notice To Proceed" of the General Conditions is amended to read:

The CONTRACTOR shall begin work within ten (10) working days from the date of Notice To Proceed (NTP) and shall diligently prosecute the same to completion before the expiration of total allocated working days as specified in the Construction Agreement and/or Invitation to Bid, from the date of starting work. The CONTRACTOR shall complete all of the work directed by the ENGINEER in all parts and requirements within the time set forth. A working day is defined in these specifications.

The CONTRACTOR is on notice that it may take approximately eight (8) weeks from the bid opening to obtain the City Council's award of the contract, to process the construction agreement, and to issue the Notice to Proceed.

The CONTRACTOR shall pay to the City of Petaluma the sum of $1500 per day for each and every *calendar day's* delay in finishing the work in excess of the number of days prescribed above (and/or in excess of the number of days prescribed for any scheduled operations or works described in the Special Provisions).

A working day is defined as any day, except as follows:

a. Saturdays, Sundays, and legal holidays
b. Days on which the CONTRACTOR is prevented by inclement weather or conditions resulting immediately therefrom adverse to the current controlling operation or operations, as determined by the ENGINEER, from proceeding with at least 75 percent of the normal labor and equipment force engaged on that

operation or operations for at least 60 percent of the total daily time being currently spent on the controlling operation or operations.

Should the CONTRACTOR prepare to begin work at the regular starting time of any day on which inclement weather, or the conditions resulting from the weather, or the condition of the work, prevents the work from beginning at the usual starting time and the crew is dismissed as a result thereof and the CONTRACTOR does not proceed with at least 75 percent of the normal labor and equipment force engaged in the current controlling operation or operations for at least 60 percent of the total daily time being currently spent on the controlling operation or operations, the CONTRACTOR will not be charged for a working day whether or not conditions should change thereafter during that day and the major portion of the day could be considered to be suitable for those construction operations.

Determination that a day is a non-working day by reason of inclement weather or conditions resulting immediately therefrom shall be made by the ENGINEER. The CONTRACTOR will be allowed 10 days from the issuance of the weekly statement of working days in which to file a written protest setting forth in what respects the CONTRACTOR differs from the ENGINEER; otherwise, the decision of the ENGINEER shall be deemed to have been accepted by the CONTRACTOR as correct. The ENGINEER will furnish the CONTRACTOR a weekly statement showing the number of working days charged to the contract for the preceding week, the number of working days of time extensions being considered or approved, the number of working days originally specified for the completion of the contract, and the number of working days remaining to complete the contract and any time extensions thereof.

3-16. HOURS OF WORK

Night Hours – Generally, other than emergency work, there will be no night hours allowed for work on this project.

Liquidated Damages in the sum of Fifteen Hundred Dollars ($1500) per day will be assessed against the CONTRACTOR if he fails to comply with any of the daily conditions or operations such as maintaining erosion control facilities, job site/street cleanliness and daily cleanup and traffic control and flagging, as described in the General Conditions, these Special Provisions, and the Technical Specifications.

If the CONTRACTOR closes a street or sidewalk without prior notice and approval of the ENGINEER within 24 hours, the associated operation will be shutdown at the CONTRACTOR's expense.

Holidays - Designated legal holidays are: January 1st, the third Monday in January, the third Monday in February, the last Monday in May, July 4th, the first Monday in September, the second Monday in October, November 11th, Thanksgiving Day, the day after Thanksgiving, December 24th and December 25th. When a designated legal holiday falls on a Sunday, the following Monday shall be a designated legal holiday. When November 11th falls on a Saturday, the preceding Friday shall be a designated legal

holiday. The Contractor shall not work on the legal holidays unless approved in writing by the Engineer.

3-17. CONSTRUCTION DRAWINGS AND RECORD ("AS-BUILT") DRAWINGS – The CONTRACTOR shall furnish Record Drawings of the complete project and procure from the Director of Public Works a full-sized set of Contract Drawings. Construction drawings shall be on the construction site at all times while the work is in progress. Drawings shall show approved substitutions, if any, of material including manufacturer's name and catalog number. The Drawings shall be to scale, and all indications shall be neat and legible. All information noted on the CONTRACTOR's job-site print shall be transferred to the Record Drawings by CONTRACTOR and all indications shall be recorded in a neat, legible and orderly way. The Record Drawings shall be signed by the CONTRACTOR and turned over to the Director of Public Works before the final acceptance of the project. If the CONTRACTOR fails to provide the City with an acceptable "Record Drawings", the City shall deduct $20,000 from the amount due CONTRACTOR.

3-18. NOTICE OF POTENTIAL CLAIM - If for any reason the CONTRACTOR deems that additional compensation is due him/her for work or materials not clearly provided for in the contract, plans, or specifications or previously authorized extra work, a Notice of Potential Claim shall be made. The CONTRACTOR shall give the ENGINEER a written Notice of Potential Claim for such additional compensation before work begins on the items on which the claim is based. The notice shall set forth the reasons for which the CONTRACTOR believes additional compensation will or may be due and the nature of the costs involved. The CONTRACTOR shall afford the ENGINEER every opportunity and facility for keeping records of the actual cost of the work. The CONTRACTOR shall keep records of the disputed work in accordance with Contract General Conditions, Section 11.3, "Cost of Work (Based on Time and Materials)."

If such notification is not given or the ENGINEER is not afforded proper opportunity by the CONTRACTOR for keeping strict account of actual cost as required, then the CONTRACTOR hereby agrees to waive any claim for such additional compensation. Such notice by the CONTRACTOR and the fact that the ENGINEER has kept account of the cost of the work shall not in any way be construed as proving or substantiating the validity of the claim. When the work on which the claim for additional compensation is based has been completed, the CONTRACTOR shall, within 10 calendar days, submit his/her written claim to the ENGINEER who will present it to the City for consideration in accordance with local laws or ordinances. The CONTRACTOR is directed to Section 17.20 "Resolution of Construction Claims" of the General Conditions.

Any claim for overhead type expenses or costs, in addition to being certified as stated above, shall be supported by an audit report of an independent Certified Public Accountant. Any claim for overhead shall also be subject to audit by the City at its discretion.

Any costs or expenses incurred by the City in reviewing or auditing any claims that are not supported by the CONTRACTOR's cost accounting or other records shall be deemed to be damages incurred by the City within the meaning of the California False Claims Act.

Nothing in this subsection shall be construed as a waiver of the CONTRACTOR's right to dispute final payment based on differences in in-place quantity measurements or computations of unit priced pay items.

3-19. PAYMENT FOR MATERIALS ON HAND - At the discretion of the ENGINEER, partial payments may be made to the extent of the delivered cost of materials to be incorporated in the work, provided that such materials meet the requirements of the contract, plans, and specifications. Such delivered costs of stored or stockpile materials may be included in the next partial payment after the following conditions are met:

1. The material has been stored or stockpiled and protected at the sole expense of the CONTRACTOR at a location acceptable to the City and in a manner acceptable to the ENGINEER.

2. The CONTRACTOR has furnished the ENGINEER with acceptable evidence of the quantity and quality of such stored or stockpiled materials.

3. The CONTRACTOR has furnished the ENGINEER with satisfactory evidence that the material and transportation costs have been paid.

4. The CONTRACTOR has furnished the City legal title (free of liens or encumbrances of any kind) to the material so stored or stockpiled.

5. The CONTRACTOR has furnished the City evidence that the material so stored or stockpiled is insured against loss by damage to or disappearance of such materials at anytime prior to use in the work.

6. The CONTRACTOR shall bear all costs associated with the partial payment of stored or stockpiled materials in accordance with the provisions of this subsection.

It is understood and agreed that the transfer of title and the City's payment for such stored or stockpiled materials shall in no way relieve the CONTRACTOR of his/her responsibility for furnishing and placing such materials in accordance with the requirements of the contract, plans, and specifications. In no case will the amount of partial payments for materials on hand exceed 70% of the contract price for the contract items in which the material is intended to be used.

3-20. ACCESS TO DRIVEWAYS – All accesses for local businesses and residents shall be maintained at all times. Temporary ramps will be required each night for access to driveways for residences and commercial access. The Contractor shall coordinate with each driveway user as needed.

3-21. ARCHAEOLOGICAL MONITORING – In the event that archaeological materials are found during construction, CONTRACTOR shall notify the ENGINEER immediately and shall temporarily cease work in the area until a determination or investigation of the site can be made by a qualified archaeologist. Archaeologist services shall be provided by the City at no cost to the CONTRACTOR.

3-22. ITEM INCREASES AND DECREASES -

Increased or Decreased Quantities

Increases or decreases in the quantity of a contract item of work will be determined by comparing the total pay quantity of that item of work with the ENGINEER's Estimate therefor.

If the total pay quantity of any item of work required under the contract varies from the ENGINEER's Estimate therefore by 25 percent or less for increases and 25 percent or less for decreases, payment will be made for the quantity of work of the item performed at the contract unit price.

If the total pay quantity of any item of work required under the contract varies from the ENGINEER's Estimate therefor by more than 25 percent for increases and 25 percent for decreases, in the absence of an executed contract change order specifying the compensation to be paid, the compensation payable to the CONTRACTOR will be determined in accordance with the following sections.

Increases of More Than 25 Percent

Should the total pay quantity of any item of work required under the contract exceed the ENGINEER's Estimate therefore by more than 25 percent, the work in excess of 125 percent of the estimate and not covered by an executed contract change order specifying the compensation to be paid therefor will be paid for by adjusting the contract unit price based upon a force account analysis.

The adjustment of the contract unit price will be the difference between the contract unit price and the actual unit cost which will be determined as hereinafter provided, of the total pay quantity of the item. If the costs applicable to the item of work include fixed costs, the fixed costs will be deemed to have been recovered by the CONTRACTOR by the payments made for 125 percent of the ENGINEER's Estimate of the quantity for the item, and in computing the actual unit cost, the fixed costs will be excluded. Subject to the above provisions, the actual unit cost will be determined by the ENGINEER in the same manner as if the work were to be paid for on a force account basis.

When the compensation payable for the number of units of an item of work performed in excess of 125 percent of the ENGINEER's Estimate is less than $5,000 at the applicable contract unit price, the ENGINEER reserves the right to make no adjustment in the contract unit price if the ENGINEER so elects, except that an adjustment will be made if requested in writing by the CONTRACTOR.

Decreases of More Than 25 Percent

Should the total pay quantity of any item of work required under the contract be less than 25 percent of the ENGINEER's Estimate therefore, an adjustment in compensation pursuant to this Section will not be made unless the CONTRACTOR so requests in writing. If the CONTRACTOR so requests, the quantity of the item performed, unless covered by

an executed contract change order specifying the compensation payable therefor, will be paid for by adjusting the contract unit price based upon a force account analysis. In no case shall the payment for that work be less than that which would be made at the contract unit price.

The adjustment of the contract unit price will be the difference between the contract unit price and the actual unit cost, which will be determined as hereinafter provided, of the total pay quantity of the item, including fixed costs. The actual unit cost will be determined by the ENGINEER in the same manner as if the work were to be paid for on a force account basis; or the adjustment will be as agreed to by the CONTRACTOR and the ENGINEER.

The payment for the total pay quantity of the item of work will in no case exceed the payment which would be made for the performance of 25 percent of the ENGINEER's Estimate of the quantity for the item at the original contract unit price.

3-23. WAGE RATES - The General Prevailing Wage Determination Made by the Director of Industrial Relations Pursuant to California Labor Code Part 7, Chapter 1, Article 2, Sections 1770, 1773 and 1773.2. The CONTRACTOR can download this information from the web site: http://www.dir.ca.gov/dlsr/PWD/

The most current prevailing wage rates available at the time of bid opening shall be used.

3-24. STAGING AREA – It is the responsibility of the Contractor to provide a staging area for equipment and materials. The site and hauling route shall be submitted to the City for approval prior to the commencement of work. The Contractor shall obtain written confirmation from property owners for use of the site.

3-25. EXISTING WATER VALVES, MONUMENTS AND MANHOLES – The City shall have access at all times to water valves, monuments, and manholes except immediately following a construction operation as noted below.

Prior to placement of paving, all manholes, monuments, and valves covered by paving, shall be clearly marked in white paint before the close of that work day. Throughout the construction process, the CITY shall have access to manholes, monuments, and valves within 48 hours of any operation affecting the manholes, monuments and valves.

A penalty of Fifty Dollars ($50) per each valve, monument, and manhole that is not raised, or that the CITY is not provided easy access to, will be assessed against the contractor for each calendar day.

3-26. WAGE RATES - The General Prevailing Wage Determination Made by the Director of Industrial Relations Pursuant to California Labor Code Part 7, Chapter 1, Article 2, Sections 1770, 1773 and 1773.2. The CONTRACTOR can download this information from the web site: http://www.dir.ca.gov/dlsr/PWD/

The most current prevailing wage rates available at the time of bid opening shall be used.

3-27. STAGING AREA –It is the responsibility of the CONTRACT to obtain any permits, rights, or permission to stockpile any and all equipment and materials during construction. The cost for all items relating to the CONTRACTOR'S staging shall be included the mobilization/demobilization bid item price.

3-28. WORK SCHEDULING – All work within 1000 feet from any school must be completed outside of the school year. In general, the window for work near a school is late June to late August. It is the responsibility of the contractor to determine the calendar year for each school within the work limits, and ensure that no work within 1000 feet of each campus is performed during their school year.

3-29. CONSTRUCTION MANAGEMENT – The Contractor shall adhere to the following site management procedures:

- Excavations shall be guarded by readily visible barricades, rails, or other effective means to avoid access by the public.
- Contractor shall remove and clear away dry, combustible vegetation from construction sites in those areas that contain substantial fire risks and hazards.
- Vehicles shall not park in areas where exhaust systems contact combustible materials. Fire extinguishers shall be available on the construction site when working in high fire hazard areas to assist in quickly extinguishing any small fires. The Contractor shall have on site the phone number for the local fire department and shall have a phone available when working in high fire hazard areas.
- All potentially contaminated materials encountered during construction shall be evaluated in the context of applicable local, state, and federal regulations. All materials deemed to be hazardous shall be remediated and/or disposed of in accordance with the most recent edition of applicable federal, state, and local regulations, standards, laws, ordinances and codes.
- Construction byproducts and pollutants such as oil, cement, and wash water shall be prevented from discharging into streams and creeks, and shall be collected and transported back to a landfill authorized to accept hazardous wastes.
- No construction vehicles or equipment may be parked within the upland riparian corridor of any stream channel.
- Mobile equipment shall not be refueled or serviced within the riparian corridor.
- Construction material storage areas containing hazardous or potentially toxic materials shall be bermed to prevent the discharge of pollutants to runoff water. These materials shall be stored under cover.
- Construction equipment and vehicles shall be maintained to prevent contamination of soil from leaking hydraulic fluid, fuel, grease, and oil.
- The Contractor shall adhere to the City of Petaluma's noise ordinance
- Newer equipment with improved noise muffling shall be used. Equipment items shall have the manufacturer's recommended noise abatement measures, such as mufflers, engine covers, and engine vibration isolators intact and operational.

3-30. REVEGETATION/LANDSCAPE REPLACMENT – All plants used for replacement of existing landscaping shall be from locally grown stock or from a nursery that has an approved monitoring program for the glassy winged sharpshooter. Contractor shall submit

evidence of compliance with this requirement as part of the submittal process. All trees that have been removed during construction shall be replaced in kind.

The Contractor shall perform a survey to determine the types of plants, trees, and shrubs to be removed for construction. The Contractor shall conform to Section 80 Earthwork for removal and revegetation of the work area.

3-31. CONSTRUCTION STAKING - This work shall consist of furnishing and setting construction stakes and markers by the CONTRACTOR to establish the lines and grades required for the completion of the work as shown on the plans and as specified in the Standard Specifications and these special provisions

The existing surface elevations shown on the plan profile are approximate only. The CONTRACTOR shall be required to verify and rectify them, if needed, as part of the construction staking.

Construction staking shall be performed by the CONTRACTOR as necessary to control the work. Construction stakes and marks shall be furnished and set with accuracy adequate to assure that the completed work conforms to the lines, grades, and sections shown on the plans.

All computations necessary to establish the exact position of the work from control points shall be made by the CONTRACTOR.

Construction stakes shall be removed from the site of the work by the CONTRACTOR when no longer needed.

Full compensation for construction staking shall be considered as included in the prices paid for various items of work and no additional compensation will be allowed therefore LL the plans and as specified in the Standard Specifications and these special provisions

3-32. EXCAVATION DEWATERING – Due to the depth of the potential excavation pits for boring and/or directional drilling pits, dewatering of the pits may be required to facilitate construction activities. The contractor shall anticipate potential dewatering activities and include the cost in the various bid items of the project. The contractor may discharge groundwater to the city's sewer system but is required to test and obtain a discharge permit from the city prior to doing so.

3-33. STREET RESURFACING – Both Maria Drive and Sonoma Mountain Parkway are on the City's 5-year Moratorium list and are considered to be newly resurfaced streets. Pavement resurfacing shall conform to City Ordinance No. 2266 N.C.S. paving requirements. Any trenching or potholing within Maria Drive or Sonoma Mountain Parkway will be required to be resurfaced to minimum City Standards therein.

3-34. NOISE MITIGATION MEASURE - SOUND BARRIER – Sound attenuation measures will be required due to the proximity of the work area to dwellings, businesses and park areas. Sound attenuation measures shall include all work necessary to design, furnish, install, maintain and remove a temporary sound attenuation barrier ("sound barrier"), and conduct a full-scale sound test. The sound attenuation barrier shall be installed at the location shown on the plans. The sound barrier procurement and installation shall be paid at the bid price for "Noise Mitigation Measures"

3-35. STORM WATER MANAGEMENT, AND SEDIMENT AND EROSION CONTROL – CONTRACTOR shall prepare storm water management, and sediment and erosion control measures for implementation and shall maintain these measures during the construction period as required by the Regional Water Quality Control Board (RWQCB) permit.

If the area to be disturbed by construction activities is more than one acre, the CONTRACTOR shall be required to file a Notice of Intention (NOI), pay the fee, prepare the SWPPP, BMP, etc. as required by RWQCB permit.

Storm water management, and sediment and erosion control shall include, but not be limited to fiber rolls (sediment logs or wattles), straw bales, drain rock, check dams, silt fencing, siltation basins and as required for construction conditions. Measures shall be submitted to the ENGINEER for review seven (7) days prior to start of construction. The CONTRACTOR shall be responsible for providing the measures that would comply with the RWQCB.

The CONTRACTOR shall also place drain rock bags around storm drain inlets/catch basins and install drain rock check dams at 50-foot intervals within 100 feet upstream from the inlets/catch basins.

The CONTRACTOR shall comply with all Federal, State and local regulations and ordinances governing storm water pollution prevention.

If required, the CONTRACTOR shall file a Notice of Intent (NOI) with the RWQCB and shall comply with the National Pollution Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Association with Construction Activity requirements. The CONTRACTOR shall prepare and implement a Storm Water Pollution Plan (SWPPP). Resources used in developing the SWPPP shall include the "California Storm Water Best Management Practice Handbook for Construction Activity," and the San Francisco Bay Regional Water Quality Control Board's "Information on Erosion and Sediment Controls for Construction Projects." The SWPPP shall be submitted for review and acceptance prior to start of work. The CONTRACTOR shall have an accepted and implemented SWPPP as part of Mobilization. The SWPPP shall, at a minimum, include Best Management Practices (BMPs), acceptable to the City, to address the following:

1. Housekeeping
2. Waste Containment and Control.
3. Minimizing Disturbed Areas.
4. Stabilize Disturbed Areas.
5. Protect Slopes and Channels.
6. Control Site Perimeter.
7. Control of Internal Erosion.

8. Disposal of Storm Water and Ground Water
9. Sediment Control.
10. Liquid Waste Management.
11. Concrete Waste Management.
12. Hazardous Waste Management.
13. Employee and SUBCONTRACTOR Training.
14. Vehicle and Equipment Fueling and Maintenance.
15. Spill Prevention and Control.
16. Contaminated Soil Management.
17. Sawcutting.
18. Paving and Asphalt Work.
19. Street Cleaning.

Employ and utilize environmental protection methods, obtain all necessary permits, and fully observe all local, state, and federal regulations.

All costs involved for completing all work described in this section shall be considered to be included in the contract price paid for Storm Water Management and Sedimentation/Erosion Control and no additional compensation shall be allowed therefore.

SECTION IV

TECHNICAL SPECIFICATIONS

TECHNICAL SPECIFICATIONS

100% Design Submittal
ECWRF
Chemical System Upgrades

Prepared for:

The City of Petaluma
3890 Cypress Drive
Petaluma, California 94954

Prepared by:

DUDEK
605 Third Street
Encinitas, CA 92024
Contact: Dennis Michael Metts, P.E.

AUGUST 2024

INTENTIONALLY LEFT BLANK

TECHNICAL SPECIFICATIONS AND PLANS
TABLE OF CONTENTS

Section		No. of Pages
DIVISION 1 – GENERAL REQUIREMENTS		
01100	Summary of Work	4
01142	Maintenance of Plant Operations	4
01205	Measurement and Payment	6
01300	Submittals	4
01301	Schedule of Values	3
01330	Meetings and Coordination	5
01400	Quality Requirements	7
01500	Construction Facilities and Temporary Controls	20
01730	Record Drawings	2
01900	Permits and Other Regulatory Requirements	3
DIVISION 2 – SITEWORK		
02000	Sitework General Requirements	1
02010	Geotechnical Investigation	2
02050	Clearing, Grubbing, and Demolition	7
02140	Dewatering	4
02160	Sheeting, Shoring, and Bracing	6
02200	Site Preparation, Excavation and Earthwork	7
02223	Trenching, Backfilling and Compaction	7
02270	Temporary Erosion Control	4
02510	Asphalt Paving	8
DIVISION 3 – CONCRETE		
03100	Concrete Formwork	5
03200	Reinforcement Steel	6
03290	Joints in Concrete	9
03300	Cast-in-Place Concrete	28
03600	Grout	8
DIVISION 4 – MASONRY		
(NOT USED)		
DIVISION 5 – METALS		
05120	Structural Steel	5
05220	Concrete Bolts	3
05500	Miscellaneous Metals	6
DIVISION 6 – WOOD AND PLASTICS		
06615	Fiberglass Reinforced Plastic Components	4

TECHNICAL SPECIFICATIONS AND PLANS
TABLE OF CONTENTS

Section		No. of Pages
DIVISION 7 – THERMAL AND MOISTURE PROTECTION		
07920	Sealants and Caulking	5
DIVISION 8 – OPENINGS		
(NOT USED)		
DIVISION 9 – FINISHES		
09900	Painting and Coating	20
DIVISION 10 – SPECIALTIES		
10401	Signage	2
DIVISION 11 – EQUIPMENT		
11001	General Equipment Provisions	22
11312	Submersible Mixer	4
11321	High Density Crosslinked Polyethylene Tanks	10
11324	Submersible Pumps	6
11330	Peristaltic Metering Pump	10
11415	In-Line Flow Measuring Systems	4
11430	Chemical Feed Systems	4
11500	Eyewash/Safety Shower Station	5
DIVISION 12 – FURNISHINGS		
(NOT USED)		
DIVISION 13 – SPECIAL CONSTRUCTION		
13000	Instrument and Control System	18
13140	Fiberglass Reinforced Plastic Buildings	3
13425	Control Strategies	17
13470	SCADA PLC System	13
13471	PLC I/O List	4
DIVISION 14 – CONVEYING SYSTEMS		
(NOT USED)		
DIVISION 15 - MECHANICAL		
15051	General Piping Requirements	12
15052	Pressure Testing of Pipe	6
15054	Disinfection of Piping	7
15061	Ductile Iron Pipe	8
15065	PVC Gravity Sewer and Drain Pipe	6
15066	Small-Diameter PVC/CPVC Pressure Pipe	7
15090	Pipe Hangers and Supports	14

Section		No. of Pages
15100	Manual, Check, and Process Valves	13
15165	Mechanical Pipe Couplings	6
15401	Hoses and Accessories	1
15485	Electric Water Heaters	3

DIVISION 16 – ELECTRICAL

16000	Requirements for Electrical Work	16
16025	Electrical Demolition and Modifications	3
16075	Electrical Identification	5
16222	Motors	8
16940	Electrical Testing	4

DIVISION 17 – INSTRUMENTATION
(NOT USED – SEE DIVISION 13)

END OF SECTION

Section **No. of Pages**

INTENTIONALLY LEFT BLANK

SECTION 01100

SUMMARY OF WORK

PART 1 - GENERAL

1.01 GENERAL

A. The work to be performed under this Contract shall consist of:

1. Furnishing all tools, equipment, materials, supplies, and manufactured articles.
2. Furnishing all labor, transportation and services, including fuel, power, water, and essential communications.
3. Performing all work, or other operations required for the fulfillment of the Contract in strict accordance with the Contract Documents.
4. The work shall be complete.
    a. All work, materials, and services not expressly indicated or called for in the Contract Documents which may be necessary for the complete and proper construction of the work shall be provided by the Contractor as though originally indicated, at no increase in cost to the Agency.

1.02 PROJECT LOCATION

A. The work to be performed under this Contract is located at the City of Petaluma Ellis Creek Water Recycling Facility (ECWRF) located at:

202 N McDowell Blvd

Petaluma, CA 94954.

1.03 SUMMARY OF WORK

A. The work generally includes, but is not limited to construction of the following:

1. Construction of a sodium hypochlorite storage and feed system, paved access road, and 1W and 3W water line extensions as described in the Design Report.

B. Constraints on the project.

1. Work hours
    a. Contractor will have access to the ECWRF site between the hours of 7:00 AM and 5:30 PM for the duration of the project. Work is limited to the hours of 7:30 AM to 5:00 PM unless required for utility shutdowns or requested by the Contractor or Owner and as otherwise agreed upon in writing by both parties.

1.04 CONTRACTOR'S USE OF THE PROJECT SITE

A. The Contractor's use of the project site shall be limited to its construction operations for this project.

B. Construction equipment and materials shall not be stored on public or private streets, roads, and rights-of-way where they will prevent free and safe passage of the traveling public unless permitted by the Agency of Jurisdiction.

C. It is anticipated that the work site provides sufficient space to store equipment and materials.

1. If found otherwise, the Contractor shall not unreasonably encumber the premises with his materials.

2. It is the Contractor's responsibility to find and obtain permission from other property owners for the storage of equipment and materials on their property.

D. If required, the Contractor shall provide, at his own expense, the necessary right-of-way and access to the work, which may be required outside the limits of Agency's property.

1.05 AGENCY'S USE OF THE PROJECT SITE

A. The Contractor shall allow the Agency unimpeded access to the project site at all times during the period of construction.

1. The Agency shall have access to the site to conduct normal operations.

2. The Contractor shall not interfere with the operation of the Agency's equipment at the site during construction.

3. The Contractor shall cooperate and coordinate with Agency to facilitate Agency's operations and to minimize interference with the Contractor's operations at the same time.

1.06 ACCESS TO THE PROJECT SITE

A. It is the Contractor's responsibility:

1. To maintain and repair any damage caused by the Contractor to existing roads or adjoining properties that are caused by the Contractor's ingress or egress.

a. All repairs to damaged roads or properties shall be equal to or better than the existing and must meet the Agency of Jurisdiction's satisfaction.

1.07 WORK BY OTHERS

A. The Contractor shall cooperate fully with all utility forces of the Agency or forces of other public or private agencies engaged in the relocation, altering, or otherwise rearranging of utilities which interfere with the progress of work and shall schedule the work so as to minimize interference with said relocation, altering, or other rearranging of facilities.

B. Selective testing and special inspection services will be provided by the City's construction management representative and testing agency. These services include the following:

1. Concrete cylinder break tests, slump tests and other concrete related tests as specified in Section 03300.
2. Soil density and compaction tests as specified in Section 03300.
3. Asphalt tests and base coarse compaction tests as specified in Section 02510.
4. Special inspections as listed in the tables in Drawing S-3.

C. All other specified testing shall be provided by the Contractor. Any factory inspection and testing for the fiberglass enclosure shall be provided by the Contractor as specified in Section 13140.

1.08 EASEMENTS AND RIGHT OF WAY

A. The Contractor shall confine his construction operations to within the right of way limits as shown on the Drawings or make special arrangements with property owners for the additional area required. Any damage to property, either inside or outside the limits of the rights of way, shall be the responsibility of the Contractor as specified herein. The Contractor shall remove, protect, and replace all fences or other items encountered on private property and restore the affected areas to the condition in which they existed prior to the Contractor's use. Before final payment will be authorized by the Agency, the Contractor will be required to furnish the Agency with written releases from property owners where side agreements or special easements have been made by the Contractor or where the Contractor's operations, for any reason, have not been kept within the right of way, or from property owners that complained to the Agency or the Agency's Representative about damage to their property resulting from the Contractor's operations.

1.09 STAGING AREAS

A. The Contractor shall locate all staging and lay down areas that he may require for the performance of the work. The Agency has identified staging areas for the Contractor to stockpile material, locate a job site trailer, maintain equipment from, and perform any of the activities required to complete the work required for this project. The Contractor staging area is identified on the design drawings.

B. If the Contractor elects to utilize an off-site staging area, then the off-site staging area must be approved by the Agency. The Contractor shall demonstrate to the Agency that the selected off-site staging area is a totally disturbed site (i.e., previously graded with no vegetation, paved, gravel/asphalt area) and its use would not result in any impacts to sensitive biological or cultural resources.

1.10 SHUTDOWN RESTRICTIONS

A. The Contractor shall make a written request to schedule a shutdown of an Agency pipeline or facility required to perform the work at least fourteen (14) days in advance.

1. The Agency may refuse to perform the shutdown on the day requested by the Contractor due to operational circumstances or other reasonable concerns by the Agency.
2. No request will be denied for arbitrary reasons.
3. The Agency will, at all times, make the decision of the appropriateness and readiness for the shutdown.
4. The Agency may cancel the shutdown, up to the last minute, at no additional cost to the Agency if:
    a. The Contractor is not ready at the designated time with all required labor, materials, and equipment to perform the work.
    b. In the opinion of the Agency the weather will severely impact the length of the shutdown, quality of the finished work product, or ability of the Contractor to perform the work.

c. The Agency's operations personnel have determined that the shutdown is not timely due to operation circumstances or unforeseen circumstances.

5. The Agency does not guarantee the shutdown facility will be completely dry or leak tight after it is removed from service.

a. The Contractor shall provide all necessary equipment and material to control, remove, and dispose of any excess water.

1.11 SUGGESTED SEQUENCE OF CONSTRUCTION

A. The Contractor shall prepare a Sequence of Work for the Agency's review and approval within 30 days of issuance of the Notice to Proceed.

1. A suggested work sequence is as follows:

a. Initiate/Obtain required permits and approvals

b. Rough grading and tree removal

c. Yard piping

d. Precise grading and surfacing

e. Building foundations and equipment pads

f. Equipment installations and above grade structures

g. Commissioning and startup

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01142

MAINTENANCE OF PLANT OPERATION (MOPO)

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Requirements for maintaining plant operation

1.02 RELATED REQUIREMENTS

A. Section 01100, Summary of Work

B. Section 02000, Sitework General Requirements

C. Division 11 Equipment

1.03 PAYMENT FOR DAMAGES

A. Damages for Extended Shutdowns

1. For any unscheduled or extended shutdowns resulting from Contractor's operations and for failing to meet the permissible scheduling shutdown time frames, the Owner will be incurring damages.

2. Contractor shall compensate the Owner two thousand dollars ($2,000) for each occurrence of exceeding the permissible shutdown time limit, and an additional one thousand dollars ($2,000) for each additional day of extended shutdown.

B. Damages for Wastewater Spills

1. The Contractor shall compensate the owner for the costs of any and all fines and claims arising from the Contractor negligently causing or allowing a wastewater spill.

2. Contractor shall be fully responsible for containing, recovering, and legally disposing of any spilled wastewater arising from the Contractor negligently causing or allowing a wastewater spill.

1.04 COORDINATION OF SHUTDOWNS

A. Coordinate all shutdowns and demolition with Owner's Representative. Contractor shall submit a list of planned shutdowns at the pre-construction meeting for the Owner's review and submit an MOP form a minimum of 7 days in advance of each individual planned shutdown.

B. Notify, in writing, the Owner's Representative before any existing tank, process unit, or equipment item is required to be shutdown.

C. Tank or process unit shutdowns shall only be allowed if approved by the Owner.

D. Only the Owner will be allowed to shutdown equipment or process units.

E. Contractor shall notify the Owner's Representative as to which valve closures are necessary to perform the Work. Valve closures shall be reviewed by the Owner's Representative prior to performing the Work. Only the designated Owner staff shall operate valves.

1.05 SUBMITTALS

A. Contractor shall submit the following in accordance with Section 01300:

1. Maintenance and operation plan that describes in detail the following within 30 days of Notice to Proceed:

    a. Dimensional information, details, and scaled sketches describing all temporary components used for maintenance of plant operation in the areas listed in this spec, including, but not limited to the following:

        (1) Piping, equipment, materials, instrumentation and controls

        (2) Connection locations and details

        (3) Methods for process isolation, including bulkheading procedures

    b. Sequence of Construction for each area listed in this spec, including specific timing for taking equipment, pipelines, channels, and process systems out of service and putting equipment, pipelines, channels, and process systems back in service. Shutdowns shall be allowed only when approved by the Owner's Representative.

    c. List of planned shutdowns submitted prior to the pre-construction meeting.

2. MOP form to Owner's Representative requesting approval for shutdowns. MOP form shall be submitted at least 7 days in advance of proposed shutdown and shall list specific timeframe and work sequence proposed for shutdown.

3. Spill Containment Contingency Plan (Plan)

    a. Submit to the Owner for review within 30 days of the Notice to Proceed.

    b. The Spill Containment Contingency Plan shall be implementable 24 hours per day, 7 days per week and provide sufficient detail to contain and control any inadvertent wastewater spills.

    c. The Plan shall detail staffing, dikes, containment berms, equipment, impacted areas of the plant and emergency operation plan to demonstrate to the Owner sufficiently that the plan is reasonable, implementable and provides sufficient protection to the plant operations, plant staff and the receiving waters.

1.06 POND

A. Operational Constraints: Shutdown of this process is only allowed between May 1 and October 1.

1.07 ELECTRICAL POWER

A. Operational Descriptions: Electrical power conduit and cable is installed throughout the plant which continuously provides power to process equipment.

B. Permissible Shutdowns: Any shutdown needs to be coordinated with the City and approved in writing.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 GENERAL

A. Contractor shall provide all labor, equipment, materials, and temporary controls to maintain the operation and functionality of existing treatment facilities, including all existing process and control units, while the plant is under construction, except as specified herein.

B. All temporary measures including pumping, piping, electrical feeds, electrical power, controls, wiring, and equipment, which are necessary to maintain the functionality of the existing plant shall be provided by the Contractor at no additional cost to the Owner.

C. Contractor shall meet the requirements listed herein for the specified plant areas. For plant areas not listed in this Specification, Contractor shall maintain existing functionality and capacity of plant in continuous, uninterrupted service.

D. Contractor is responsible for the means and methods for maintenance of plant operation and may submit for approval exceptions to this Specification or alternate methods to those listed herein. Deviations from the requirements of this specification will not be allowed without prior written consent of the Owner.

E. Material, size, and locations of existing utilities and points of connection shown on the plans are approximate and based on available information from record drawings and limited potholing exploration. The Contractor shall be responsible for field verifying material, size, and locations and elevations of existing utilities, points of connections, and utility crossings. Where field conditions differ from the plans, the Contractor shall notify the Owner's Representative and document any differences from the plans.

3.02 CONSTRUCTION ACCESS

A. Contractor is responsible for preparing construction access route around the site and maintaining temporary access road throughout the duration of construction in accordance with the access and staging requirements shown in the plans.

B. Contractor shall maintain access to the site and process units at all times during construction. No construction activities shall interfere with ongoing operations. If normal access routes are obstructed, Plant Staff shall be notified in advance and an alternate route around the impacted area shall be provided.

3.03 PROCESS ISOLATION

A. Bulkhead channels or other structures as necessary to perform work. Coordinate bulkheading of channels and structures with the Owner.

B. When an existing piping system is isolated from the treatment system, it shall be drained completely by pumping the drained sewage or liquid to the on-site plant sewer or influent pump station, unless otherwise approved by the Owner.

C. The Contractor shall prevent sewage from leaking onto the site or into the soil.

D. Contractor shall provide temporary means of pipe plugging, pipe isolation, or system isolation to maintain functional process units.

3.04 ODOR CONTROL MEASURES

A. Maintain odor control during construction

B. Provide odor containment covers for any openings created during construction in the structures containing wastewater (influent, primary influent, primary effluent, etc.) to maintain negative air pressure in headspace.

C. Seal openings where covers over wastewater channels or structures are opened to allow penetration for piping.

D. Plug, cover or seal all openings in controlled spaces when work is not being performed

E. Ensure wastewater is not open to atmosphere for more than 4 hours during bulkheading operations.

F. Provide temporary carbon scrubbers as necessary to maintain negative air pressure in wastewater area headspace.

3.05 ELECTRICAL, COMMUNICTION, INSTRUMENTATION AND CONTROLS

A. Contractor shall perform all construction in a manner that allows existing electrical, communication, instrumentation and control utilities to remain in service and be protected in place unless otherwise specified. The Contractor shall include in its Bid the cost associated with supporting all existing electrical boxes, conduits, and other electrical appurtenances in place to perform the Work.

B. If it becomes necessary to provide temporary power and/or communication to maintain equipment in service, Contractor shall provide this power and/or communication at no additional cost to the Owner. Contractor shall relocate all electrical pull boxes and electrical utilities where they interfere with pipe alignments, at no additional cost to the Owner.

C. Contractor shall provide temporary controls for all automated systems when it becomes necessary to interrupt service to existing controls. Manual operation of automatic equipment and systems shall be allowed only if approved by the Owner's Representative.

END OF SECTION

SECTION 01205

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 WORK OF THIS SECTION

A. Measurement and preparation of applications for Payment.

1.02 RELATED SECTIONS

A. The Work of the following Sections apply to Work of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of the Work.

1. Bid Proposal Form
2. Section 01100 – Summary of Work
3. Section 01301 – Schedule of Values

1.03 SUBMITTALS

A. Partial Billings

B. Final Billing

1.04 SUBMITTAL FORMAT

A. Invoice Form:

1. Schedules and Invoices shall be 8 1/2" x 11".
2. Present all Schedules and Invoices in typewritten format.

1.05 MEASUREMENT - GENERAL

A. Unless otherwise specified, quantities of work shall be determined from measurements or dimensions in horizontal planes. However, linear quantities of materials, such as pipe, piling, fencing and timber, shall be considered as the true length measured along a longitudinal axis.

B. Unless otherwise specified, volumetric quantities shall be the product of the mean area of vertical or horizontal sections and the intervening horizontal or vertical dimensions.

C. Materials and items of work which are to be paid for on basis of measurement shall be measured in accordance with methods stipulated in the particular sections involved.

D. When payment is to be made on the basis of weight, the weighing shall be done on certified platform scales or, when approved by the Owner's Representative on a completely automated weighing and recording system. The Contractor shall furnish the Owner's Representative with duplicate weighmaster's certificates showing the actual net weights.

E. Items of work indicated to be paid on a "Lump Sum", "L. S." or "Job" basis will be measured in the most logical units for the item as indicated on the accepted Schedule of Values.

1.06 PAYMENT - GENERAL

A. The quantities listed in the Bid Schedule will not govern final payment. Payment to the Contractor will be made only for actual quantities of Contract items constructed in accordance with the Plans and Specifications. Upon completion of construction, if the actual quantities show either an increase or decrease from the quantities given in the Bid Schedule, the Contract Unit Prices will prevail.

B. The unit and lump sum prices to be paid shall be full compensation for the items of work and all appurtenant work, including furnishing all materials, labor, equipment, tools, and incidentals.

C. Payment will not be made for materials wasted or disposed of in a manner not called for under the Contract. This includes rejected material not unloaded from vehicles, material rejected after it has been placed, and material placed outside of the Plan lines. No compensation will be allowed for disposing of rejected or excess material.

D. Payment for work performed or materials furnished under an Assessment Act Contract will be made as provided in particular proceedings or legislative act under which such contract was awarded.

E. Whenever any portion of the Work is performed by the Owner at the Contractor's request, the cost thereof shall be charged against the Contractor, and may be deducted from any amount due or becoming due from the Owner.

F. Whenever immediate action is required to prevent injury, death, or property damage, and precautions which are the Contractor's responsibility has not been taken and are not reasonably expected to be taken, the Owner may, after reasonable attempt to notify the Contractor, cause such precautions to be taken and shall charge the cost thereof against the Contractor, or may deduct such cost from any amount due or becoming due from the Owner. Owner action or inaction under such circumstances shall not be construed as relieving the Contractor or its Surety from liability.

G. Payment shall not relieve the Contractor from its obligations under the Contract; nor shall such payment be construed to be acceptance of any of the Work. Payment shall not be construed as the transfer of ownership of any equipment or material to the Owner. Responsibility of ownership shall remain with the Contractor who shall be obligated to store any fully or partially completed work or structure for which payment has been made; or replace any materials or equipment required to be provided under the Contract which may be damaged, lost, stolen or otherwise degraded in any way prior to acceptance of the Work.

H. Guarantee periods shall not be affected by any payment.

I. If, within the time fixed by law, a properly executed notice to stop payment is filed with the Owner, due to the Contractor's failure to pay for labor or materials used in the Work, all money due for such labor or materials will be withheld from payment to the Contractor in accordance with applicable laws.

J. Partial payments made after the contract completion date will reflect the amount withheld for Liquidated Damages. Any such partial payments made to the Contractor, or its Sureties, will not constitute a waiver of the Owner's Liquidated Damages.

K. If requested by the Owner's Representative, the Contractor shall provide such additional data as may be reasonably required to support the submitted Invoice. Such data may include but is not limited to satisfactory evidence of payment for equipment, materials and labor including payments to Subcontractors and suppliers. Request for payment for delivered equipment and material shall be accompanied by certified paid invoices from the supplier. Such equipment and material shall be suitably and safely stored at the site of the Work.

1.07 PAYMENT LINE ITEMS

A. Payment for the various items of the Bid Proposal, as further specified herein, shall include all compensation to be received by the Contractor for furnishing all tools, equipment, supplies, and manufactured articles, and for all labor and services, operations, and incidentals appurtenant to the items of Work being described, as necessary to complete the various items of the Work all in accordance with the requirements of the Contract Documents, including all appurtenances thereto, and including all costs of permits and cost of compliance with the regulations of public agencies having jurisdiction, including Safety and Health Requirements of the California Division of Industrial Safety and the Occupational Safety and Health Administration of the U.S. Department of Labor (OSHA) as administered by the state of California (CAL-OSHA). No separate payment will be made for any item that is not specifically set forth in the Bid Proposal, and all costs therefor shall be included in the prices named in the Bid Proposal for the various appurtenant items of Work.

B. The Contractor shall provide all materials, equipment, and labor necessary to carry out the Work of the Project, complete and in-place, as indicated below and in the Bid Schedule contained in the Bidding Documents, of the Contract.

1.08 WORK BREAKDOWN STRUCTURE (WBS) BID ITEM DESCRIPTIONS

A. Bid schedule, designated as bid line items numbers consist of work defined in the Contract Documents.

B. Bid Item #1 – General Requirements:

1. Method of Payment: Lump Sum
2. Measure of Payment: Percent Complete
3. Description: Price shall constitute full compensation for costs and work necessary including but not limited to labor, supervision, materials, equipment, transportation, administration, management, etc. necessary for satisfactory completion of the Work specified in the Contract Documents, including all work for utility locating and potholing, demolition, civil, structural, coating, bypassing, mechanical, electrical, and instrumentation, etc. not described in other bid items. Also include in this line item cost of meetings, submittals, temporary construction measures, quality control, project administration, scheduling and reporting, startup, testing, commissioning, and project closeout.

C. Bid Item #2 – Mobilization/Demobilization:

1. Method of Payment: Lump Sum
2. Measure of Payment: Percent Complete
3. Description: Price shall constitute full compensation for work in advance of construction operations including, but not limited to: obtaining all required insurance, bonds and permits; moving onto the site all materials and equipment; furnishing and erecting

construction facilities, implementing security requirements, and video taping of initial conditions and construction photographs. This line items shall not exceed three percent (3%) of the total bid.

D. Bid Item #3 – Sheeting, Shoring, and Bracing:

1. Method of Payment: Lump Sum

2. Measure of Payment: Percent Complete

3. Description: Price shall constitute full compensation for all work performed including, but not limited to all labor, supervision, materials, equipment, transportation, etc. required for sheeting, shoring, and bracing. Activities and works include, but are not limited to, designing, preparing submittals, furnishing, installing, maintaining, and removal of sheeting, shoring, bracing, and appurtenances associated with the earth support systems. Sheeting, shoring, and bracing system installation and usage shall meet or exceed all Local, Regional, and State regulatory requirements. All sheeting, shoring, and bracing shall be removed prior to completion of the Project.

E. Bid Item #4 – Storm Water Pollution Prevention Plan:

1. Method of Payment: Lump Sum

2. Measure of Payment: Percent Complete

3. Description: Price shall constitute full compensation for all work performed including, but not limited to all labor, supervision, materials, equipment, transportation, etc. required for compliance with the Regional Water Quality Control Board, General Construction Activity Storm Water Permit and the Storm Water Pollution Prevention Plan.

F. Bid Item #5 – Demolition:

1. Method of Payment: Lump Sum

2. Measure of Payment: Percent Complete

3. Description: Price shall constitute full compensation for all work performed including, but not limited to all labor, supervision, materials, equipment, transportation, etc. required to demolish as shown on the drawings. Include in this line item all costs associated with repairs and restoration of facilities following demolition.

G. Bid Item #6 – Civil Work:

1. Method of Payment: Lump Sum

2. Measure of Payment: Percent Complete

3. Description: Price shall constitute full compensation for all work performed including, but not limited to all labor, supervision, materials, equipment, transportation, etc. required to complete all civil work including, but not limited to site preparation, clearing and grubbing, grading, backfilling, subgrade remediation, yard piping, drainage structures, finished grading, hauling/exporting excess material, importing materials, paving pond resurfacing, dewatering and any other appurtenant work to the project as indicated in the Contract Documents.

H. Bid Item #7 – Dewatering:

1. Method of Payment: Lump Sum
2. Measure of Payment: Percent Complete
3. Description: Price shall constitute full compensation for all work performed including, but not limited to all labor, supervision, materials, equipment, etc. required to complete all dewatering work during the project as indicated in the Contract Documents.

I. Bid Item #8 – AC Pavement:

1. Method of Payment: Square Feet
2. Measure of Payment: Percent Complete
3. Description: Price shall constitute full compensation for all work performed including, but not limited to all labor, supervision, materials, equipment, transportation, etc. required to complete all site paving as indicated in the Contract Documents.

J. Bid Item #9 –Structural Work:

1. Method of Payment: Lump Sum
2. Measure of Payment: Percent Complete
3. Description: Price shall constitute full compensation for all work performed including, but not limited to all labor, supervision, materials, equipment, transportation, etc. required to complete all structural work including, but not limited to, cast-in-place concrete structures, formwork, placing and curing concrete, stairs and ladders, hand rails, equipment pads, footings, foundations, and any other appurtenant structural work to the project as indicated in the Contract Documents.

K. Bid Item #10 – Chemical Storage Tanks:

1. Method of Payment: Each
2. Measure of Payment: Percent Complete
3. Description: Price shall constitute full compensation for all work performed including, but not limited to all labor, supervision, materials, equipment, transportation, etc. required to furnish three chemical storage tanks as indicated in Contract documents..

L. Bid Item #11 – 3” PVC Pipe Schedule 80:

1. Method of Payment: Liner Foot
2. Measure of Payment: Percent Complete
3. Description: Price shall constitute full compensation for all work performed including, but not limited to all labor, supervision, materials, equipment, transportation, etc. required to complete all mechanical, and miscellaneous work including procurement and installation of 3” PVC pipe as indicated in Contract Documents. Include in this bid line item Contractor's costs for procurement administration, overhead, logistics, supervision, and incidentals associated with equipment. Include in this line item furnishing and installing piping.

M. Bid Item #12 – Mechanical Work:

1. Method of Payment: Lump Sum

2. Measure of Payment: Percent Complete

3. Description: Price shall constitute full compensation for all work performed including, but not limited to all labor, supervision, materials, equipment, transportation, etc. required to complete all mechanical, and miscellaneous work including equipment procurement and installation. Include in this bid line item Contractor's costs for procurement administration, overhead, logistics, supervision, and incidentals associated with equipment. Include in this line item furnishing, installing, starting up and commissioning of pumps and pump motors, tanks, mixers, plumbing systems and fixtures and all other mechanical systems.

N. Bid Item #13 – Electrical, Instrumentation and Control:

1. Method of Payment: Lump Sum

2. Measure of Payment: Percent Complete

3. Description: Price shall constitute full compensation for all work performed including, but not limited to all labor, permitting, supervision, materials, equipment, transportation, procurement, delivery, logistics of materials necessary for complete installation of the electrical systems including, but not limited to, coordination with utility service provider (Pacific Gas & Electric), trenching, excavation, backfill, compaction, placement of slurry mixes, furnishing and installing duct banks, conduit, pullboxes, grounding equipment, wires, wiring, switches, transformers, interface connections, motor control centers, integrated power centers, electrical equipment and components, standby diesel engine generator, automatic transfer switch for standby diesel engine generator, installation of control panels and materials, and appurtenances necessary to electrically connect, test, and start-up the electrical system as specified in the Contract Documents.

O. Bid Item #14 – Protective Coatings:

1. Method of Payment: Lump Sum

2. Measure of Payment: Percent Complete

3. Description: Price shall constitute full compensation for all work performed including, but not limited to all labor, supervision, materials, equipment, transportation, etc. required to complete all protective coatings as indicated in the Contract Documents.

PART 2 - PRODUCTS

2.01 SCHEDULE OF COMPLETED VALUES

A. The Schedule of Completed Values shall be a tabular listing of the Items of Work from the approved Schedule of Values.

B. The Schedule of Completed Values shall show for each Item of Work the Item Number; Description; Item Value; Percent and Value Complete for the previous period; Percent and Value complete for the current period; Value of Stored Materials (if any); and the Total Billing Value.

C. Each issued Field Order and Change Order shall be listed on the Schedule of Completed Values as a separate Item.

D. A Schedule of Completed Values shall be attached to each Invoice presented for payment.

2.02 INVOICES

A. Invoices shall be prepared on Contractor letterhead, dated and addressed to:

B. Invoices shall have the following subject block:

Attn: City of Petaluma
Project Title: Ellis Creek Water Recycling Facility Chemical Systems Upgrade Project
Contract P.O. No.: {CONTRACT PURCHASE ORDER NUMBER}
Invoice Number: {CONTRACTOR'S INVOICE NUMBER}
Invoice Period: {INVOICE PERIOD ENDING DATE}

C. Invoices shall be consecutively numbered and show the Amount of Original Contract; Value of Approved Changes; Current Contract Amount; Total Billing Value from the Schedule of Completed Values; Percentage and Value of Retention (if any); Value of Previous Invoices; and Payment Amount Due.

D. Each Invoice shall bear the Contractor's signature and the signature of the Owner's Representative. An electronic copy/scan of each invoice shall be submitted via email to the Engineer and the Owner's Representative. The email subject line shall be "ECWRF Chemical Systems Upgrade Invoice #" followed by the invoice number.

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01300

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Submittals include all drawings, diagrams, illustrations, schedules and other data which are specifically prepared by or for the Contractor to illustrate some portion of the Work and all illustrations, brochures, standard schedules, performance charts, instruction, diagrams and other information prepared by the manufacturer, fabricator, supplier or distributor and submitted by Contractor to illustrate material or equipment for some portion of the Work as required by the Contract Documents.

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

1.02 CONTRACTOR'S RESPONSIBILITIES

A. The Contractor shall be responsible for the accuracy and completeness of the information contained in each submittal and shall assure that the material, equipment, or method of work shall be as described in the submittal. Submittals shall contain all required information, including satisfactory identification of items, units and assemblies in relation to the Contract Drawings and Specifications. The Contractor shall verify that the material and equipment described in each submittal conforms to the requirements of the Specifications and Drawings. Unless otherwise approved by the Owner, submittals shall be made only by the Contractor, who shall indicate by a signed stamp on the submittals that the Contractor has checked the submittals and that the work shown conforms to contract requirements and has been checked for dimensions and relationship with work of all other trades involved. If the information shows deviations from the Specifications or Drawings, the Contractor, by statement in writing accompanying the information shall identify the deviations and state the reason(s) therefore. The Contractor shall ensure that there is no conflict with other submittals and shall notify the Owner in each case where the Contractor's submittal may affect the work of another contractor or the Owner. The Contractor shall insure coordination of submittals among the related crafts and subcontractors. Submittals are not acceptable directly from Subcontractors, suppliers, or manufacturers.

1.03 SUBMITTAL LOG

A. The Contractor shall prepare and furnish a schedule and Submittal Log listing all required submittals to be submitted, including required submittals by all Subcontractors. Extension of contract time will not be granted as a result of the Contractor's failure to make timely submittals. Contractor shall not purchase materials or equipment or begin construction activities covered by the required submittal until such submittal has been reviewed, accepted and returned.

1.04 TRANSMITTAL PROCEDURE

A. General: Submittals regarding material and equipment shall be accompanied a transmittal form. The transmittal form shall be dated, signed, and sequence numbered identifying as to initial or resubmittal status, and fully describing the submittal content. A separate form shall be used for each specific item, class of material, equipment, and items specified in separate, discrete sections for which a submittal is required. However, submittals for various items shall be made with a single form only when the items taken together constitute a manufacturer's package or are so functionally related that expediency indicates checking or review of the group or package as a whole.

B. Submittal Identification. Each set of submittals or samples shall be identified by sequential submittal number that consists of two parts: XXX-Z. The XXX shall be sequential number 001 for the first item submitted, 002 for the second, etc. The Z shall be the consecutive letters of a specific submittal or resubmittal (A for the first submittal, B for the first resubmittal, etc.). All submittals shall show the contract title, shall indicate the name of the vendor, and shall indicate when the equipment and/or material will be required by the construction schedule. The submittal must be adequate to permit a comprehensive review without further reference to the Contractor. In each submittal the Contractor shall state the Drawing numbers and Specification Sections, Articles, and paragraphs to which the submittal pertains.

C. Method of Submittal. Each submittal or shop drawing shall be submitted to the Engineer electronically in Adobe PDF format. The submittal will be returned to Contractor in PDF format for correction and changes if required.

D. Shop Drawings. Each shop drawing shall be complete with respect to dimensions, design criteria, materials, connections, bases, foundations, anchors, and the like, and shall be accompanied by technical and performance data as necessary to fully illustrate the information in the shop drawings. Unless otherwise specified, each Shop Drawing shall be submitted on 24-inch x 36-inch bond paper and folded to 8-1/2 inch x 11-inch in size. If clearly legible at half-size, Shop Drawings may be submitted on 11-inch x 17-inch bond paper.

E. Samples. Unless otherwise specified, submittals requiring samples shall include two (2) sets of samples. One set of approved samples and all disapproved samples will be returned to the Contractor.

F. Deviations. If the Contractor proposes to provide material or equipment which does not conform to the Contract Documents, Contractor shall give notice in writing in the transmittal form of any deviation. The notice shall include, in writing, a reason for the change with the submittal, all other changes required to correlate work items and all variation in costs occasioned by the deviations and Contractor's assumption of the cost of all related changes if deviation is approved. All costs associated with proposed deviations including assembling required information requested by the Owner's Representative shall be borne by the Contractor. Pertaining to Contractor's proposed Deviations, Substitutions, or "OR-EQUAL" Item

1. The burden of proof as to the type, function, and quality of any such substitution product, material or equipment shall be upon the Contractor.
2. The Owner will be the sole judge as to the type, function, and quality of any such substitution and the Owner's decision shall be final.
3. Acceptance by the Owner of a substitution item proposed by the Contractor shall not relieve the Contractor of the responsibility for full compliance with the contract documents and for adequacy of the substitution.

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

H. Submittal Materials Quality. Submittals shall be composed of clean, legible copies of manufacturer's literature, calculations, diagrams, etc. which are pertinent to the subject of the submittal. Where literature is provided that describes various styles or different components, the portion of the literature pertinent to the subject of the submittal shall be highlighted or otherwise clearly noted.

1. Facsimiles of information shall not be acceptable as part of a submittal package. A submittal which incorporates facsimiles shall be subject to rejection.

2. Submittals which include illegible information due to poor reproduction quality or any other reason shall be subject to rejection.

1.05 REVIEW PROCEDURE

A. General: Submittal will be reviewed only for conformance with the design concept of the Project and with the information given in the Contract Documents. The approval of a separate item as such will not indicate approval of the assembly in which the item functions. The approval of submittals shall not relieve the Contractor of responsibility for any errors and omissions in the submittals or for the accuracy of dimensions and quantities, the adequacy of connections, and the proper and acceptable fitting, execution and completion of Work.

B. Review and Approval: Within twenty-one (21) calendar days after receipt of the submittal by the Owner's Representative, the submittal shall be reviewed and returned. At the Owner's discretion, the Owner may review the submittals prior to, simultaneously, or after the Engineer has reviewed the submittals. On complex drawings and equipment the Owner's Representative shall acknowledge receipt within 21 days and advise the Contractor when the submittal will be returned. RFI responses shall be provided within 14 days of receipt.

C. The returned submittals shall indicate one of the following actions:

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

2. If the review indicates limited corrections are required, copies will be marked "MAKE CORRECTIONS NOTED". The Contractor may begin implementing the work method or incorporating the material and equipment covered by the submittal in accordance with the noted corrections. Where submittal information will be incorporated in Operation and Maintenance data, a corrected copy shall be provided.

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

4. If the review indicates that the material, equipment, or work method is not in general conformance with the design concept or in compliance with the Drawings and Specifications, copies of the submittal will be marked "REJECTED". Submittal with deviations which have not been identified clearly may be rejected. Except at its own risk,

the Contractor shall not undertake work covered by such submittal until a new submittal is made and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED".

D. Corrections and Re-submittals. Contractor shall make all required corrections and shall resubmit the required number of corrected submittals until approved. Re-submittals shall include the entire submittal package. No changes shall be made by the Contractor on re-submittals other than those changes indicated on the reviewed submittal, unless such changes are clearly described in a letter accompanying the re-submittal.

1. It is considered reasonable that the Contractor shall make a complete and acceptable submittal to the Engineer by the second submission of a submittal item. The Owner reserves the right to withhold monies due to the Contractor to cover additional costs of the Owner's Representative's review beyond the second submittal.

1.06 EFFECT OF REVIEW OF CONTRACTOR'S SUBMITTAL

A. Review of drawings, methods of work, or information regarding materials or equipment the Contractor proposes to provide, shall not relieve the Contractor of its responsibility for errors therein and shall not be regarded as an assumption of risks or liability by the Engineer or the Owner, or by any other officer, employee, or subcontractor thereof, and the Contractor shall have no claim under the contract on account of the failure or partial failure, of the method of work, material, or equipment so reviewed. A mark of "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED" shall mean that the Owner has no objection to the Contractor, upon its own responsibility, using the plan or method of work proposed, or providing the materials or equipment proposed.

B. "REVISE/RESUBMIT" or REJECTED" indicated on shop drawings shall be considered as changes necessary to meet the requirements of the contract plans and specifications and shall not be taken as the basis of claims for extra work. The Contractor shall have no claim for damages or extension of time due to any delay resulting from making required revisions to shop drawings. The review of said drawings by the Engineer or the Owner will apply to general design only and will in no way relieve the Contractor of responsibility for errors or omissions contained therein nor will such review operate to waive or modify any provisions or requirements contained in these contract specifications or on the contract drawings. The Contractor is hereby advised that no more than two reviews of each shop drawing submittal will be allowed for this contract at Owner expense. Additional processing effort by the Owner's Representative or its consultant for submittal review or to address excessive Request for Information applications may be backcharged to the Contractor. For substitution of equipment requests by the Contractor, backcharges for expenses for review to meet conformance with specifications may also be required in advance.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01301

SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 DESCRIPTION

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

B. The Schedule of Values shall include a breakdown of labor, materials, equipment and other costs. The schedule shall also show the division of work between the Contractor and each of the Subcontractors. The Schedule of Values shall be broken down according to each Specification Division within each project area or structure on the site.

C. Include an item in the Schedule for local, county, and State taxes. The Contractor may also include cost items for bond, insurance, temporary facilities and mobilization. The Contractor shall provide supporting data as requested by the Owner for any Schedule item. Schedule shall also include items for the purchase/delivery costs for each item and material which the Contractor will request payment prior to installation. Each item shall include overhead and profit directly proportional to the direct cost of that item over the total Contract cost.

D. Assign prices to Bid Items which aggregate the Contract Price. Base prices on costs associated with scheduled activities for each Bid Item of Work.

E. The finalized Schedule of Values shall not be approved until the Contractor has responded to all review comments of the Owner. The Contractor shall provide supporting data, including certified payrolls, as requested by the Owner for any Schedule item.

1.02 SUBMITTALS

A. Submit Schedule of Values as described in the General Conditions (GC Article 2.7) and herein in accordance with the following timeline:

Deliverable	Paragraph Reference	Submittal Time
Preliminary Schedule of Values	1.03.A	Within 7 days from Notice of Award
Owner Review of Preliminary Schedule of Values	1.03.B	Within 7 days from receipt of Preliminary Schedule of Values Submittal
Detailed Schedule of Values	1.04.A & 1.04.B	Within 14 days from receipt of Owner Review Comments of Preliminary Schedule of Values or Preconstruction Conference, whichever is later
Owner Review of Detailed Schedule of Values	1.04.C	Within 14 days from receipt of Owner Review Comments of Detailed Schedule of Values

Deliverable	Paragraph Reference	Submittal Time
Submittal of First Pay Request		No sooner than 14 days after Owner acceptance of Detailed Schedule of Values

B. Upon request, support prices with data that will substantiate their correctness.

1.03 PRELIMINARY SCHEDULE OF VALUES

A. The Contractor shall submit a Preliminary Schedule of Values for each Bid Item identified in the Bid Schedule for the major components of the Work as indicated in the General Conditions. The listing shall include, at a minimum, the proposed value for the following major work components associated with the Bid Schedule. Schedule of Values shall also include the following:

1. The total value of civil site work
2. The total value of electrical work.
3. The total value of Instrumentation and Control work.
4. The total value of Coatings Systems work.
5. The total value of yard mechanical work inclusive of excavation, pipe installation, testing and backfill of pipe, and all incidental work associated with underground pipe installations.
6. The total value for mechanical work shall be broken down into separate values for each new and existing structure constructed or modified as a part of the work.
7. The total value for structural work. Miscellaneous and minor concrete work may be listed as one item in this breakdown.

B. The Contractor and Owner's Representative shall meet and jointly review the preliminary Schedule of Values and make any adjustments in value allocations if, in the opinion of the Owner's Representative, these are necessary to establish fair and reasonable allocation of values for the major work components. Front end loading will not be permitted. The Owner's Representative may require reallocation of major work components from items in the above listing if in the opinion of the Owner's Representative such reallocation is necessary.

1.04 DETAILED SCHEDULE OF VALUES

A. The Contractor shall prepare and submit a detailed Schedule of Values for the Bid Schedule to the Owner's Representative. The detailed Schedule of Values shall be based on the accepted preliminary Schedule of Values for major work components. Because the ultimate requirement is to develop a detailed Schedule of Values sufficient to determine appropriate monthly progress payment amounts, sufficient detailed breakdown shall be provided to meet this requirement. The Owner's Representative shall be the sole judge of acceptable numbers, details and description of values established. If, in the opinion of the Owner's Representative, a greater number of Schedule of Values items than proposed by the Contractor is necessary, the Contractor shall add the additional items so identified by the Owner's Representative.

B. The minimum detail of breakdown of the major work components is indicated below. Greater detail shall be provided as directed by the Owner's Representative.

1. Section 01320, "Scheduling and Reporting," broken down by submittal.

2. Work shall be broken down by discipline: structural, electrical, instrumentation and controls, mechanical, civil, and painting and coating.

3. Equipment testing and plant startup broken down for completion milestones for each.

4. All other work not specifically included in the above items shall be broken down as necessary for establishment of pay and Schedule activity items.

C. The Contractor and Owner's Representative shall meet and jointly review the detailed Schedule of Values. The value allocations and extent of detail shall be reviewed to determine any necessary adjustments to the values and to determine if sufficient detail has been. Any adjustments deemed necessary to the value allocation or level of detail shall be made by the Contractor and a revised detailed Schedule of Values shall be submitted to the Owner's Representative for record.

1.05 CROSS REFERENCE LISTING

A. To assist in the correlation of the Schedule of Values and the CPM Schedule, the Contractor shall provide a Cross Reference Listing which shall be furnished in two parts. The first part shall list each Scheduled Activity with the breakdown of the respective valued items making up the total cost of the activity. The second part shall list the valued item with the respective Scheduled Activity or Activities that make up the total cost indicated. In the case where a number of schedule items make up the total cost for a valued item (shown in the Schedule of Values) the total cost for each scheduled item shall be indicated.

B. These listings shall be updated and submitted in conjunction with the CPM monthly submittals as stated in Specification Section 01320.

C. Approved change orders reflected in the CPM Schedule shall be incorporated into the Schedule of Values as a single unit identified by the change order number.

1.06 CHANGES TO SCHEDULE OF VALUES

A. Changes to the CPM Schedule which add activities not included in the original schedule but included in the original work (schedule omissions) shall have values assigned as approved by the Owner's Representative. Other activity values shall be reduced to provide equal value adjustment increases for added activities as approved by the Owner's Representative.

B. In the event that the Contractor and Owner's Representative agree to make adjustments to the original Schedule of Values because of inequities discovered in the original accepted detailed Schedule of Values, increases and equal decreases to values for activities may be made.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01330

MEETINGS AND COORDINATION

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION

A. This section describes minimum requirements for meetings. Additional meetings may be required by the Owner; the Contractor shall not be entitled to any additional compensation.

B. Unless otherwise specified, the Owner's Representative will prepare agenda, preside at meetings, and prepare and distribute a transcript of proceedings to all parties.

C. The Contractor shall provide data required and be prepared to discuss all items on agenda.

1.02 MEETINGS

A. Progress Meetings:

1. General: Regular meetings to review progress, schedule, and administrative processes with Owner's Representative and Contractor.
2. Occurrence: Weekly, or as designated by the Owner's Representative.
3. Schedule: As determined by Owner's Representative.
4. Place: Owner Representative's field office, or mutually agreed upon location.
5. Attendance:
    a. Contractor, Project Superintendent required. Subcontractors and, suppliers as necessary. Representatives present for each party shall be authorized to act on their behalf.
    b. Engineer
    c. Design Engineer, when necessary
    d. Engineer's design subconsultants, when necessary
6. Agenda:
    a. Transcript of previous meeting (Owner's Representative)
    b. Progress since last meeting (Contractor)
    c. Planned progress for next period; 3-week minimum (Contractor)
    d. Submittal Review Status (Owner's Representative / Engineer)
    e. Problems, conflicts and observations (Owner's Representative / Engineer / Contractor)
    f. Change Orders (Owner's Representative / Engineer)
    g. Applications for payment status (Owner's Representative)
    h. Quality standards and control (Owner's Representative / Engineer)
    i. Schedules, including off-site fabrication and delivery schedules (Contractor)

j. Corrective measures required (Owner's Representative / Engineer / Contractor)

k. Coordination between parties (All Parties)

l. Other business (All Parties)

B. Pre-Construction Conference:

1. General: Conference to confirm chain of communication, define administrative processes, and discuss specific construction expectations defined below.

2. Occurrence: Conference will be held after execution of the Contract and before construction begins.

3. Schedule: The Owner's Representative will fix the date and time of the meeting.

4. Place: Owner Representative's field office, or mutually agreed upon location.

5. Attendance:

a. Contractor, major subcontractors. Representatives present for each party shall be authorized to act on their behalf.

b. Design Engineer.

c. Engineer's design subconsultants, when necessary.

d. Representatives of government agencies having relevant degree of control or responsibility, if available.

6. Agenda:

a. Designation of responsible personnel and contact information

b. Identification of Sub-contractor responsibilities

c. Coordination with other contractors

d. Construction Schedule

e. Submittal review process

f. Request for information (RFI) process

g. Field Change and Change Order process

h. Requirements for copies of Contract Documents

i. Insurance in force

j. Schedule of Values

k. Processing and Schedule of Payment Requests

l. Uses of premises: security, access, housekeeping, material storage, etc.

m. Contractor responsibility for safety and first aid procedures

n. Field Offices

o. Record Drawings

p. Notice to Proceed

q. Other project related items

r. Permit Requirements

C. Project Schedule Review Meeting:

1. General: To review updated CPM Schedule.
2. Occurrence: Monthly
3. Schedule: On the 20th workday of each month, or a mutually agreed upon date.
4. Place: Owner Representative's field office, or mutually agreed upon location.
5. Attendance:
    a. Contractor, project manager and superintendent.
    b. Owner's Representative or Construction Manager
6. Agenda:
    a. Review updated CPM Schedule.
    b. Identify schedule deficiencies and corrective action, if any.
    c. Review contract time adjustments for pending change orders.

D. Instrumentation and Control System Pre-Submittal Conference:

1. General: Conference to review and approve the manner in which the Contractor intends to respond to the Division 17 Contract requirements before any submittals are prepared. Refer to Division 17 specifications for further requirements.
2. Occurrence: Prior to any instrumentation or control system submittals.
3. Schedule: Conference shall be arranged by the Contractor no more than 30 days following Notice to Proceed. Contractor shall provide minimum 10 working days notice to the Owner's Representative.
4. Place: Owner Representative's field office, or mutually agreed upon location.
5. Attendance:
    a. Contractor and I&C sub-contractor, and electrical sub-contractor.
    b. Major control system suppliers (i.e. control panel fabricators)
    c. Owner's Representative
    d. Design Engineer.
6. Agenda:
    a. Designation of responsible personnel
    b. Contractor shall present a list of equipment and materials required and the manufacturer and model number proposed by the Contractor for each item and the name of the company that will install each item.
    c. Contractor shall present a list of any exceptions to the Plans and Specifications along with a brief explanation of each. Approval will be subject to formal submittal.
    d. Contractor shall present a sample of each type of submittal specified in the Construction Documents.
    e. Contractor shall present a flow chart showing the steps to be taken in preparing and coordinating each system.

f. Contractor shall present a bar chart CPM schedule for all control system related activities from the pre-submittal conference through start-up, testing, and training. Schedule shall indicate dates relative to submittals, design, fabrication, factory acceptance testing, deliveries, installation, and field testing. Identify key milestone dates identified in the Contract Documents.

g. Contractor shall present the method and procedures for meeting the coordination requirements of the Specifications.

h. Contractor shall present the method and procedures for system check out, including general outline of factory tests.

i. Contractor shall present the method and procedure for commissioning.

j. Contractor shall present the proposed wiring numbering system. The proposed wiring numbering system shall include numbering provisions for the major systems suppliers so that work can be fully coordinated with the I&C Sub-contractor.

E. Post-Construction Conference:

1. General: A post construction conference shall be held prior to final inspection of the work to discuss and resolve all unsettled matters. The bonds and insurance to remain in force, and the other documents required to be submitted by the Contractor will be reviewed and any deficiencies determined. Schedules and procedures for the final inspection process, and for the correction of defects and deficiencies shall be discussed and agreed.

2. Occurrence: Prior to final inspection of the work.

3. Schedule: Conference shall be requested by the Contractor when final punchlist items are complete.

4. Place: Owner Representative's field office, or mutually agreed upon location.

5. Attendance:

a. Contractor, Superintendent, and sub-contractors, as appropriate

b. Engineer.

6. Agenda:

a. Review of documents required to be submitted by the Contractor.

b. Identification of deficiencies.

c. Review schedule and procedure for final inspection process.

d. Confirm schedule for correction of defects and deficiencies.

1.03 COORDINATION

A. Coordinate scheduling, submittals and work of the various section of the Specifications to assure an efficient and orderly sequence of installation of interdependent construction elements.

B. Verify that utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

C. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on the drawings. Follow routing shown for pipes and conduit, as

closely as practicable, place runs parallel with line of building. Use spaces efficiently to maximize accessibility for other installations, for maintenance and for repairs.

D. Coordinate completion and clean-up of work of separate sections in preparation for Substantial Completion and for portions of work designated for Owner's partial utilization.

E. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of the Owner's activities.

F. Coordinate with other contractors working onsite to avoid impacting their operations, and to ensure that facility interfaces are properly joined. Where proper execution of the work is dependent on work by others, inspect and promptly report discrepancies and defects to the Owner's Representative.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01400

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 REGULATORY REQUIREMENTS

A. General: The laws, regulations, and codes together with local amendments when applicable adopted by the State and other governmental authorities having jurisdiction shall establish minimum requirements for this project.

B. Laws and Regulations: See Article 11 of the General Conditions.

C. Code Requirements:

1. This project shall comply with the latest edition of the following:
    a. International Building Code (IBC), latest edition.
    b. NFPA 1: Fire Code (2015)
    c. Uniform Mechanical Code (UMC) latest edition
    d. Uniform Plumbing Code (UPC) latest edition
    e. National Electric Code (NEC) latest edition
    f. California Building Code latest edition
2. Paragraphs addressing Pre-Engineered Systems and Performance Specifications in other Sections cover the Contractor's responsibility to comply with code requirements when:
    a. Performance specifications are used to describe all or portions of Work or items and;
    b. Pre-engineered (contractor designed) systems are specified.
3. In cases where the Contract Documents are more restrictive than applicable codes, the Contractor shall comply with the Contract Documents

1.02 REFERENCES

A. Abbreviations:

1. Whenever the following terms are used, the intent and meaning shall be as follows:

AASHTO	American Association of State and Highway Transportation Officials
AAMA	Architectural Aluminum Manufacturers Association
ABMA	American Boiler Manufacturers Association
ACI	American Concrete Institute
ADC	Air Diffusion Council
AGA	American Gas Association
AGMA	American Gear Manufacturer's Association

AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	Air Moving and Conditioning Association
ANSI	American National Standard Institute
APA	American Plywood Association
API	American Petroleum Institute
AREA	American railway Engineers Association
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Construction Managers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
AWPA	American Wood-Preserver's Association
AWS	American Welding Society
AWWA	American Water Works Association
CAGI	Compressed Air and Gas Institute
CAL/OSHA	State of California Department of Industrial Relations, Division of Industrial Safety
CBM	Certified Ballast Manufacturers
CBR	California Bearing Ratio
CI	Chlorine Institute
CISPI	Cast Iron Soil Pipe Institute
CMAA	Crane Manufacturers Association of America
CPSC	Consumer Products Safety Commission
CRA	California Redwood Association
CRSI	Concrete Reinforcing Steel Institute
CTI	Cooling Tower Institute
DFPA	Douglass Fir Plywood Association
EASA	Electronic Apparatus Service Association
EIA	Electronic Industries Association
EPA	U.S. Environmental Protection Agency
ETL	Electronic Testing Laboratory
FM	Factory Mutual Insurance Company
FPS	Fluid Power Society
FS	Federal Specifications
GO 95	General Order No. 95, California Public Utilities Commission rules for Overhead Electric Line Construction

HI	Hydraulic Institute
HMI	Hoist Manufacturers Institute
IAPMO	International Association of Pluming and Mechanical Officials
IBR	Institute of Boiler and Radiator Manufacturers
ICBO	International Conference of Building Officials
IEEE	Institute of Electrical and Electronic Engineers
IES	Illuminating Engineering Society
IPCE	International Power Cable Engineers Association
ISA	Instrument Society of America
NAAMM	National Association of Architectural Metal Manufacturers
NBS	National Bureau of Standards
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
OSHA	Occupational Safety and Health Act
PCMAC	Prestressed Concrete Manufacturers Association of California
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SSPC	Structural Steel Painting Council
TCA	Tile Council of America
UBC	Uniform Building Code
UPC	Uniform Plumbing Code
UL	Underwriters Laboratories
WCLIB	West Coast Lumber Inspection Bureau
WIC	Woodwork Institute of California

B. Definitions: See Article 1 of the General Conditions.

C. Reference Standards: Where local codes or standards are referred to in these Specifications, the CONTRACTOR may inspect such documents at the City or County office.

1.03 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 1 Section "Submittal Procedures."

F. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

G. Testing Agency Qualifications

1. An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

   a. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.

   b. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

I. Specialists

1. Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

   a. Requirement for specialists shall not supersede building codes and regulations governing the Work.

1.04 QUALITY CONTROL

A. Owner's Quality Control

1. Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

   a. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.

   b. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor’s Quality Control

1. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

   a. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

      (1) Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

   b. Notify testing agencies at least 48 (forty-eight) hours in advance of time when Work that requires testing or inspecting will be performed.

   c. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

   d. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

   e. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Mockups

1. Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

   a. Build mockups in location and of size indicated or, if not indicated, as directed by Owner’s Representative.

   b. Notify Owner’s Representative 7 (seven) days in advance of dates and times when mockups will be constructed.

   c. Demonstrate the proposed range of aesthetic effects and workmanship.

   d. Obtain Owner’s Representatives approval of mockups before starting work, fabrication, or construction of remainder of the Work.

   e. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

   f. Demolish and remove mockups only after approval by Owner’s Representative.

D. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Sections in Divisions 2 through 16.

E. Testing and Inspection Services

1. General

   a. See Article 17 of the General Conditions.

2. Costs of Testing

   a. The Contractor shall be responsible for, and shall pay for, all quality control and off-site tests of materials required, including laboratory work for soil testing and concrete testing during construction.

b. The Engineer shall have the right to witness all off-site tests and the Contractor shall furnish adequate notice of when tests will be made. The Contractor shall be responsible for, and shall pay for, all source quality control and all on-site tests of materials required, except those tests specifically noted to be performed and paid by the Owner.

c. The Engineer shall have the right to witness all on-site tests performed by the Contractor and the Contractor shall furnish adequate notice of when such tests shall be made.

d. When, in the opinion of the Engineer additional tests or inspections are required because of the manner in which the Contractor executes its work, such tests and inspections will be paid for by the Owner, but will be deducted from the Contract price. Examples of such additional tests and inspections are: tests of materials substituted for previously accepted materials, or substituted for specified materials, or retests made necessary by failure of material to comply with the requirements of the Specifications.

3. Retesting/Re-inspecting

a. Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents.

4. Testing Agency Responsibilities

a. Cooperate with Owner’s Representative and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

b. Notify Owner’s Representative and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

c. Determine the location from which test samples will be taken and in which in-situ tests are conducted.

d. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

e. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.

f. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.

g. Do not perform any duties of Contractor.

F. Repair and Protection

1. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

a. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

b. Comply with the Contract Document requirements for cutting and patching.

2. Protect construction exposed by or for quality-control service activities.

3. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide all necessary temporary facilities and controls required for execution of the Work, including, but not limited to mobilization, storage yard, field offices, sheds, temporary utilities, construction aids, barriers and enclosures, security, establishing fire protection system, access roads and parking areas, and demobilization. The costs of these temporary facilities and controls are considered incidental to the Work and shall be included in the Contractor's bid proposal.

B. Construction of this project may expose the Contractor's workmen to the hazard of materials underground and materials from nearby existing facilities, sewer gas and wastewater with varying degrees of treatment. The Contractor shall certify that he is experienced and qualified to anticipate and meet the safety and health requirements of this project. The Contractor shall require his personnel to observe proper safety and hygienic precautions.

C. The Contractor shall be solely responsible for the storage, usage, handling and application of all hazardous materials encountered or provided as part of the Work.

D. No attempt is made to set out in detail means or methods necessary to satisfy requirements. Recognition of requirements is made to assist Contractor in the identification of necessary costs.

E. Stormwater and runoff controls in conformance with requirements.

1.02 RELATED WORK

A. Section 01100: Summary of Work

B. Section 01300: Submittal Procedures

C. Section 01330: Meetings and Coordination

1.03 SUBMITTALS

A. Prior to commencement of any field work, the Contractor shall submit a Construction Facilities Plan to Engineer for approval. Said plan shall show the layout, equipment, materials and procedures that Contractor proposes for construction of temporary electrical, telephone, lighting, heating, water, sanitation, field offices and sheds, and other similar site facilities needed for the Work.

B. The Contractor's site office and other construction facilities shall be of a temporary nature. The Contractor shall be wholly responsible for the security of his site office and laydown area, and for all its materials, equipment and tools at all times

C. Furnish the following submittals prior to commencement of any field work:

Submittal	Description
Storage Yard	Description of Contractor's proposed methods for dust and noise control in storage areas
	Property owner's written approval of storage yard
Construction Facilities Plan	Layout, equipment, materials and procedures proposed for construction of temporary power, telephone, lighting, heating, water, sanitation, field offices and sheds, storm water management, security, etc.
Stormwater Pollution Prevention Plan	Plan documents as described herein.
Spill Prevention and Emergency Response Plan	Plan documents and reporting as described herein.

1.04 MOBILIZATION/DEMOBILIZATION

A. Mobilization shall include the acquisition of all permits; moving onto the site of all plant and equipment; furnishing and erecting plants, temporary buildings, and other construction facilities; and implementing security requirements; all as required for the proper performance and completion of the Work. Mobilization shall include but not be limited to the following principal items:

1. Moving on to the site of all Contractors' plant and equipment required for construction operations.
2. Installing temporary construction power, wiring, and lighting facilities.
3. Establishing fire protection system.
4. Developing construction water supply as required.
5. Providing field office trailer for the Contractor (at Contractor's cost).
6. Providing all on-site communication facilities, including telephones and radios for Contractor personnel.
7. Providing on-site sanitary facilities and potable water facilities for Contractor personnel.
8. Arranging for and establishment of, Contractor's storage yard as required (Contractor is solely responsible for obtaining property owner agreements to use private property for storage or laydown areas per the contract documents).
9. Constructing and implementing security features and requirements in compliance with the Contract Documents.
10. Obtaining all required permits.
11. Having all OSHA required notices and establishment of safety programs.
12. Submitting initial submittals.

1.05 DEMOBILIZATION

A. At the completion of the project, the Contractor shall perform the following activities:

1. Remove and properly dispose of all excess or waste materials, debris, rubbish, and temporary facilities from the site, structures and all facilities.
2. Repair pavement, roads, landscaping, and all other areas affected by construction operations and restore them to original condition or to a minimum condition specified.

3. Remove spatter, grease, stains, fingerprints, direct, dust, labels, tags, packing materials, and other foreign items or substances from interior and exterior surfaces, equipment, signs, and lettering.

4. Repair, patch, and touch up chipped, scratched, dented or otherwise marred surfaces to match specified finish.

5. Remove paint, clean and restore all equipment and material nameplates, labels and other identification markings.

6. Clean all slabs, pavements and ground surfaces.

1.06 TEMPORARY UTILITIES

A. Power: Owner shall provide power for use during construction.

B. Construction Water: Unless otherwise stated, Contractor shall, at his expense, arrange to develop water sources, furnish and install piping, valves and appurtenances necessary to connect to the water supply, provide backflow protection and supply labor and equipment to collect, load, transport, and apply water as needed for compaction, testing, concrete work, dust control dust, and other construction use.

Use of the Owner's water will be under the Owner's control, and the Contractor shall follow any requirements or provisions set forth by the Owner regarding its use. The Contractor shall obtain a construction water meter from the Owner to indicate and document water usage. The Contractor(s) shall not be required to pay for the water used in the prosecution of the Work. If water is taken through fire hydrants, use one 2½-inch connection for construction water. Reserve the remaining outlets for use by fire department. The Contractor shall not draw water from any fire hydrant, except to extinguish a fire, without obtaining permission from the Owner.

Construction water shall be clean and free from objectionable deleterious amounts of acids, alkalis, salts, or organic materials. The Contractor shall use reclaimed water, where applicable and when available.

C. Drinking Water: Contractor shall provide at all times abundant supply of safe drinking water for employees and give orders against the use of, for drinking purposes, any water in the vicinity of the Work known to be unsafe.

D. Sanitation: Provide suitable and conveniently located temporary toilets, sanitation, and hand washing facilities for employees in full compliance with the rules and regulations of the State Board of Health and/or other bodies having jurisdiction. The Contractor shall not use any Owner sanitation facilities. Contractor provided toilets and sanitations facilities shall be left at the site until final inspection has been made after which temporary sanitation facilities shall be removed and site left in neat and sanitary condition. Toilets shall be cleaned at least once per week.

Do not interrupt wastewater conveyance and disposal. Should the Contractor disrupt existing sewer facilities, convey sewage in closed conduits and dispose of in a sanitary sewer system. Submit a proposed bypass system for Owner review. Do not permit sewage to flow in trenches or be covered by backfill.

Dispose of all rubbish, surplus, and waste materials of any nature occurring at the work site offsite in accordance with local, state, and federal codes and ordinances governing locations and methods of disposal, all at the contractor's expense. Establish regular intervals of collection and

disposal of such materials and waste. Take care to prevent spillage on haul routes. Contain and remove any such spillage and clean the area.

E. Communications: Construction telephone shall be available at site at all times Work is in progress. Cellular phones are acceptable.

F. Lighting: Install temporary lighting when Work is performed at night or under deficient daylight conditions to ensure correct performance, to provide for inspection, and to maintain lighting levels during working hours not less than lighting levels required by OSHA and state agency administering OSHA regulations.

1.07 CONSTRUCTION AIDS

A. Provide scaffolding, rigging, hoisting and services needed to safely deliver, support, move, and install products. Remove same from premises when installation is complete.

B. Comply with OSHA requirements and applicable laws, ordinances, rules, regulations, and orders pertaining to construction machinery and equipment, hoists, cranes, scaffolding, staging, materials handling facilities, tools, appliances and other construction aids. OSHA requirements shall govern where mandatory; otherwise Contractor shall comply with the most stringent requirements.

C. Provide railings, kick plates, enclosures, safety devices, and controls required by Laws and Regulations and as required for adequate protection of life and property.

D. Design temporary supports with adequate safety factor to assure adequate load bearing capability.

1. When requested, submit design calculations by professional engineer registered in the State of California prior to application of loads.
2. Submitted design calculations are for information and record purposes only.

E. Prepare and implement accident prevention and safety program to include, but not be limited to:

1. Exercise precautions throughout construction for protection of persons and property.
2. Observe safety provisions of applicable Laws and Regulations.
3. Guard machinery and equipment, and eliminate other hazards.
4. Make reports required by authorities having jurisdiction, and permit safety inspections of the Work.
5. Before commencing construction Work, take necessary action to comply with provisions for safety and accident prevention.

F. Adequately identify and guard hazardous areas and conditions by visual warning devices and, where necessary, physical barriers. Devices shall conform to minimum requirements of OSHA and State agency which administers OSHA regulations where Project is located.

G. Mark or guard excavations in areas from which public is excluded, in manner appropriate for hazard.

H. On multi-level structures, provide safety protection that meets requirements of OSHA and State agency which administers OSHA regulations where Project is located.

1.08 ACCESS ROADS AND PARKING AREAS

A. Construct and maintain access or haul roads required for project, and personnel movement into and within construction and excavation areas, subject to prior approval by Owner. Access facilities shall provide for surface drainage. Install and remove earth ramps as needed to protect concrete and asphalt curbs. Areas used for temporary access, haul roads and access from public roads shall be graded and restored to original. Grade conditions to Owner's satisfaction.

B. Do not block any access roads or entrances unless otherwise approved by the Owner's Representative. Maintain at least one-way traffic. Provide all signs, traffic cones and other barriers for traffic detours.

C. Plant emergency access routes shall remain open at all times. Do not excavate, store equipment, or otherwise restrict access for emergency vehicles on emergency routes. When work is required in emergency routes, provide necessary traffic control, including flagmen, to provide emergency access. Submit a plan to the Owner's Representative for review within 30 days of the Notice to Proceed to maintain emergency access and operator access to all operating facilities during construction. As circumstances and conditions change, submit revised access plans to the Owner's Representative. Immediately restore and pave emergency routes when Work is finished.

D. Treat access roads and parking areas as needed to control dust and prevent tracking of mud onto paved streets. Use a street sweeper daily to remove any mud or debris tracked from project site to public streets.

E. Contractor storage and parking areas on the treatment facility site will be designated by the Owner’s Representative, subject to change.

F. Access to the site for Contractor's and sub-contractors employees, materials, tools, and equipment shall be as shown on the Drawings. Any damage to off-site and on-site roads must be repaired in kind at no cost to Owner or property owner.

G. The Contractor shall ensure all employees, representatives, material suppliers and others acting for the Contractor, shall maintain on-site access roads free of mud. Under no circumstances shall vehicles leaving the site track mud off the site onto the public right-of-way.

H. Consult with Owner and governing authorities and establish thoroughfares which will be used as haul routes and site access.

1.09 STORM WATER POLLUTION PREVENTION

A. Contractor shall obtain and maintain compliance with Storm Water Regulations (NPDES) for Discharge of Storm Water Runoff Associated with Construction Activity. The Construction project disturbance is greater than 1 acre and requires coverage under the General Permit or preparation of a Storm Water Pollution Prevention Plan (SWPPP).

1.10 TEMPORARY CONTROLS

A. Noise Control: Comply with local noise ordinances and OSHA regulations for acceptable noise exposure, including scheduling Work to comply with noise ordinances and installing sound barriers, if needed to comply with noise ordinances and Contract Documents. All internal combustion engines in vehicles and construction equipment shall be equipped with manufacturer-recommended mufflers. Do not operate noise-generating construction equipment except during normal working hours unless written permission is obtained from Owner's Representative. Back

up bells on equipment may only be operated between 7:00 a.m. and 5:00 p.m. Air compressors and diesel engine operation will not be permitted between 5:30 p.m. and 7:00 a.m. Temporary generators will be permitted to operate between 7:00 a.m. and 5:00 p.m. providing the generator noise level will not exceed 85 dB at 3 feet. If noise at doorstep of any private residence exceeds allowable noise specified, Owner may require Contractor to pay each affected household $200 per day to cover expenses of alternative lodging.

B. Fire Prevention: Fire danger shall be minimized at and near construction site. Protect surrounding private property from fire damage resulting from construction operations. Provide sufficient number of fire extinguishers of type and capacity required to protect the Work and ancillary facilities, per local fire code requirements.

C. Storm Water Management: Conduct storm water management operations and maintain controls as needed to prevent runoff or seepage from entering excavations and to control erosion in conformance with Federal, State and local regulations. Legally dispose of surface and subsurface water. Do not allow mud, silt, or debris to flow on to adjoining or public property.

D. Protection of Existing Improvements: Exercise care to avoid injury to existing improvements, adjacent property, and trees and shrubbery that are not to be moved. Protect from injury or damage trees and shrubbery that are not to be moved, poles, fences, signs, property corners, all underground pipe and conduit, and other improvements within or near the work area. If such objects, or improvements, are injured or damaged by reason of the Contractor's operations, they shall be replaced or restored, at the Contractor's expense, to a condition at least as good as prior to construction operations.

E. Protection of Existing Utilities: For the purpose of the Contract Documents, utilities shall be considered as including but not limited to, and irrespective of ownership: pipelines (including irrigation lines), conduits, transmission lines, and appurtenances of "Public Utilities" (as defined in the Public Utilities Act of the State of California), and those of private industry, business, or individuals solely for their own use or their tenants; and storm drains, sanitary sewers, street lighting, traffic signal systems, duct banks, telephone cables, power lines, cable television, fiber optic lines, gas lines, petroleum lines, transmission cables, and completely buried structures, hereafter referred to as utilities.

Owner has endeavored to locate and indicate on the Contract Documents, utilities that exist within the limits of the project, as derived from information provided by the owners of such utilities. However, the accuracy or completeness of the utilities indicated on the Contract Documents is not guaranteed. No attempt has been made to show service connections on the Contract Documents. It shall be the Contractor's responsibility to make his own investigations, including exploratory excavations to determine exact location of utilities shown on the Contract Documents and locations of service connections prior to earthwork operations and to notify the Owner's Representative of any utility which has been incorrectly shown or omitted from the Contract Documents.

Protect in place, at no additional cost to Owner, all existing utilities running parallel to proposed pipelines, sewers, conduits, structures and all other improvements. This includes protection in place of all backfill above the utility and pipe bedding.

Work required in connection with utilities, because of interference with Contract Work, will be performed and paid for as specified in this section. However, when directed or approved by the Owner, changes in line or grade of any structure being built may be made in order to avoid utilities. Any additional costs because of such changes will be paid for as Extra Work.

The right is reserved to governmental agencies and to owners of utilities to enter at any time upon any street, alley, right-of-way, or easement for the purpose of making changes in their facilities and for the purpose of maintaining and making repairs.

The Contract Documents provide guidance regarding disclosure of utilities. This section provides guidance as to payment for protection relocation, or disposal of utilities shown and not shown on the Plans.

Contractor shall not begin any trench or excavation work until the Contractor has contacted a regional notification center as defined in California Government Code Section 4215 and the location of all utilities within the Project limits has been identified. If a Contractor hits a utility, the Contractor shall take prompt action to make sure employees and the public are not endangered. If a water line is hit, the trench must be evacuated immediately. If an oil or gas line is hit, all employees and the public shall be evacuated from the immediate vicinity. All conduits shall be treated as though they are high voltage or high current electrical conduits. Do not tamper with any conduit until the owner is called and power shut off. In all cases, call the Fire Department and utility owner immediately.

F. Advance Notification and Exposure of Utilities – In Advance of Work: It shall be the Contractor's responsibility to determine and notify those agencies requiring advance notification for inspection or other purposes before beginning construction in any jurisdictional area of any agency. Provide a minimum of forty-eight (48) hours advance notice to the various agencies before beginning construction in the area unless specified advance times and other requirements are stated in the Contract Documents or in permit requirements.

Make exploratory excavations to determine the true location and depth of all utilities shown on the Contract Documents. Determine the type of material and condition of any utility which may be affected by or affect the Work. Conduct exploratory excavations at least 1,300 feet ahead of a pipe trench heading a minimum of five (5) days in advance of planned construction to provide sufficient lead-time to resolve utility conflicts.

All costs incurred in exposing utilities shall be included in the various bid items and no additional allowance will be made therefor.

G. Utility Relocations by Owner: When it is stated in the Contract Documents that a utility is to be relocated, altered, or reconstructed by other than the Contractor, Owner will conduct all negotiations in respect to such work and the Work will be done at no cost to the Contractor. No additional compensation will be given for delays or inconvenience by others to finish their work on schedule due to unforeseen difficulties.

H. Utility Relocation by Contractor as Shown in the Contract Documents: When work on a utility is specified on the Contract Documents or indicated on the drawings to be done by the Contractor, but is not included as a separate bid item, the Contractor shall make all arrangements and coordinate with the owner of the utility regarding schedule for performance of the Work. Any costs for such Work shall be included in the unit prices or included in the lump sum amounts bid for the various Contract items. Submit a proposed method of relocation or protection of the utility for review. Review by the Owner will not relieve the Contractor of any responsibility.

I. Utility Relocation by Contractor for Its Convenience: The temporary relocation or the alteration of any utility, desired by the Contractor solely for convenience in the performance of the Work, to a position or condition other than that provided for on the Contract Documents shall be the Contractor's own responsibility. Make all arrangements with the property owners regarding such work. Any costs of such work for the Contractor's own convenience shall be absorbed in the unit

prices or included in the lump sum amounts bid for the various Contract items at no additional cost to the Owner.

J. Unknown Utility Installation by Others During Contract Work: In the event a utility is disclosed or installed subsequent to the award of Contract, such utility not being indicated on the Contract Documents, with reasonable accuracy, and when said utility is found to occupy the space required to be occupied by a part of the permanent works, that, in the judgment of the Owner's Representative, such utility requires location, relocation, removal, repair of damages, alteration, support or protection, Owner will determine the method and manner of accomplishing such work and may order the Contractor to do so pursuant to a change order issued by Owner. The Work shall be performed in accordance with Contract Documents provided or approved by Owner and in accordance with the following:

1. When said utility is found to occupy the space required to be occupied by a part of the permanent Works to be constructed under the Contract or parallel to the permanent works and within vertical planes on each side at a distance away equal to the maximum allowable trench width measured at a point 12 inches above the top of the pipe, exclusive of branches or other facilities, as specified in the Specifications for Earthwork, or to be within the specified excavation pay lines (when such are specified in the Contract Documents); Owner shall arrange for the relocation or alteration of said utility or require the Contractor to do the same.

2. Utilities found to cross the excavation, but not intercepting the permanent works to be constructed or interfering with the construction will be maintained in place at the Contractor's expense. Utilities which interfere with the construction technique in use will be protected or relocated.

3. When said utility is more or less parallel with, and any portion of it does not lie within the vertical planes specified herein above, or does not lie within the excavation pay lines (when such are specified or shown on the Contract Documents); advise Owner and Utility owner thereof, and in cooperation with the owner of the utility, provide and place the necessary support for proper protection to guarantee continuous and safe operation of the utility.

4. Continuous sanitary sewer service shall be maintained at all times. Should any existing sanitary sewer or manhole extend within the proposed excavation, submit a method of construction or support for approval by the Owner and assume all responsibilities therefor. All costs for such work shall be borne by the Contractor.

5. If the Work is done by others, the Contractor shall provide time and working space for protection and relocation as required.

6. Where undisclosed utilities are discovered and located by the Contractor when performing this Contract, immediately notify Owner in writing.

7. Owner will compensate the Contractor for its direct costs of locating, relocating, removal, repair, support or protection of the undisclosed utilities, together with the cost of equipment used for the Work necessarily idled during such Work. The Contractor will be granted an extension of time for the completion of the Contract equal to the time determined by Owner, to be reasonably necessary to perform the Extra Work and Owner will not assess liquidated damages against the Contractor for delay in completion of the Work when such delay was caused by the failure of Owner to provide for the removal or relocation of such utility facilities.

8. The Contractor will not be entitled to extra compensation or an extension of time when Extra Work is required to repair damage to undisclosed utilities caused by the failure of

the Contractor to exercise reasonable care. The Contractor will not be entitled to any compensation for indirect or consequential costs or damages incurred as a result of the Extra Work required.

K. Monuments and Survey Markers: Do not disturb any monuments or survey markers without permission from the Owner's Representative and bear the expense of resetting any monuments or survey markers which may be disturbed without permission.

L. Protect Landscaping and Vegetation: During the progress of construction take proper precautions to prevent damage to trees, plants, and shrubs. The piling of excavated material, equipment, construction materials, or anything else on top of branches or against the tree trunks will not be permitted. Notify the Owner of any potential impact to any protected tree or plant, and shall not damage, move or otherwise harm said tree or plant prior to investigation and direction from the Owner. Costs associated with damage to any protected tree tor plant shall be the sole responsibility of the Contractor.

M. Historical or Archaeological: Should any items having historical or archaeological interest be discovered in the course of any construction activities, halt work and notify the Owner's Representative immediately. Perform an on-site inspection under direction of the Owner-retained Archaeologist. The on-site inspection shall be used to make recommendations to the Owner and other applicable jurisdictions for determination of mitigation actions to be taken.

If cultural resources are encountered at any time during project excavation, avoid altering these materials and their context until a qualified archaeologist has evaluated the situation. Project personnel will not collect or retain cultural resources. Prehistoric resources include, but are not limited to, chert or obsidian flakes, projectile points, mortars, and pestles; and dark, friable soil containing shell and bone, dietary debris, heat-affected rock, or human burials. Historic resources include stone or adobe foundations or walls; structures and remains with square nails; and refuse deposits (glass, metal, wood, and ceramics) often found in old wells and privies.

Records of site inspections will be maintained in the Owner's administrative records. Following construction, a post-construction site inspection will be made to determine the degree to which the final site modifications have impacted site descriptions and future access.

N. Human Remains: In the event of accidental discovery or recognition of any human remains, the County Coroner must be notified immediately and construction activities halted. If the remains are found to be Native American, the Native American Heritage Commission must be notified within 24 hours. Follow the guidelines of the Native American Heritage Commission regarding the treatment and disposition of the remains.

O. Protection from Weather: Heat and ventilate work areas to protect the Work from damage by freezing, high temperatures, weather, and to provide safe environment for workers.

P. First Aid Information: Post first aid facilities and information posters conforming to requirements of OSHA and other applicable Laws and Regulations in readily accessible locations.

Q. Vector Control: Provide rodent and pest control as necessary to prevent infestation of construction or storage areas. Employ methods and use materials which will not adversely affect conditions at the site or on adjoining properties.

R. Environmental Contamination: Provide methods, means and facilities required to prevent contamination of soil, water or atmosphere by the discharge of noxious substances from construction operations. Provide equipment and personnel required to perform emergency

measures required to contain any spillages and to remove contaminated soils or liquids. Excavate and dispose of any contaminated earth off-site and replace with suitable compacted fill and topsoil. Take special measures to prevent harmful substances from entering public waters. Prevent disposal of wastes, effluents, chemicals, or other such substances adjacent to the river, drainages, or in sanitary or storm sewers. Provide systems for control of atmospheric pollutants. Prevent toxic concentrations of chemicals. Prevent harmful dispersal of pollutants into the atmosphere. All Contractor's equipment used during construction shall conform to all current federal, state and local laws, ordinances, regulations and standards.

S. Odor Control: Furnish all labor, materials, and equipment required to carry out effective measures wherever and as often as necessary to prevent the discharge of a nuisance odor from its operation into the atmosphere in such quantity as will violate the regulations of any legally constituted authority. During construction, the Contractor shall notify the Owner's Representative at least forty-eight (48) hours in advance of any potential odor-causing activities scheduled for construction.

T. Chemicals: The following paragraph does not relieve the Contractor from its responsibility for obtaining prior approval from the Owner for chemical usage when otherwise required.

Provide four (4) copies of the MSDS to the Owner's Representative for all chemicals used during construction or operational activities, prior to bringing them on site, whether defoliant, soil sterilant, herbicide, pesticide, disinfectant, polymer, reactant, or of other classification, which shall show approval of either the U.S. Environmental Protection Agency or the U.S. Department of Agriculture. Use of all such chemicals and disposal of residues shall be in strict accordance with the printed instructions of the manufacturer.

U. Explosives for Blasting: The use of explosives on the Work shall not be permitted.

V. Protection of Wildlife: If any work in this Contract might disturb wildlife, even in urban areas, hire a Biological Monitor to provide assistance in the field to assure that biological resources are protected and that project-specific mitigation measures are implemented. The Biological Monitor shall be qualified for the tasks to be performed. If endangered or threatened species are present in the project area and require removal or relocation, the Biological Monitor must hold the appropriate permits and approvals for access and capture or marking of the species of concern. Specific activities of the Biological Monitor may include the following:

1. Marking areas to be protected from construction activity.
2. Observing construction activities and their impacts on biota.
3. Capturing and relocating biota as necessary to protect them from construction activities.

Prior to the removal of healthy trees at a worksite, a Biological Monitor must survey the trees to determine if active bird nests are present. If nests of sensitive species are present, tree removal will be scheduled to avoid the nesting season. Provide a written record of whether tree removal is require, and as needed, hire a biologist or provide documentation that nesting birds (listed species of special interest of those as threatened or endangered) are not present in the trees to be removed.

W. Groundwater Dewatering: Construct all permanent improvements in areas free from water. Construct and maintain all permanent or temporary slopes, dikes, levees, drainage ditches, and sumps necessary for removal of water from work areas. Design, furnish, install, maintain, and operate all necessary pumping and other dewatering equipment required for dewatering the various work areas and for maintaining the foundation and other work areas free from water from any and all sources whatsoever.

Perform no excavation below any standing water level regardless of water source until the area has been dewatered. Perform dewatering by use of filtered well points or gravel-packed deep wells in such a manner as to protect adjacent structures.

Dewatering shall be accomplished in a manner that will prevent loss of fines from the foundation, will maintain stability of all excavated slopes and bottoms of excavations, and will permit all construction operations to be performed in the dry. Perform dewatering of excavations to the extent required to permit placement of compacted fill materials in the dry and to prevent sloughing of the excavation side slopes. Lower the groundwater level a minimum of three feet below foundation grade prior to foundation preparation and placement of structural foundations. During the placement and compaction of fill or bedding materials, maintain the water level at every point within the limits of fills being placed a minimum of three feet below fill placement level.

Dewatering shall consist of furnishing all approved Plans, labor, equipment and materials, performing all Work to design, construct, and operate dewatering systems, maintaining in a safe and dewatered condition the areas on which the construction Work will be performed, and removing the dewatering system upon completion of the Work.

Submit for the Owner's review, drawings and data showing proposed plan for dewatering of all work areas, which shall include the planned method of dewatering, excavation and shoring plan, location and capacity of such facilities as dewatering wells, well points, pumps, sumps, collection and discharge lines, standby units proposed, and protective fills and ditches required for control of groundwater and surface water The plan for dewatering shall be submitted to the Owner's Representative 15 days prior to the start of excavation. Furnish such other information as may be required for the complete understanding and analysis of the dewatering and excavation plan by the Owner's Representative.

Review by the Owner's Representative will not relieve the Contractor of the responsibility for the adequacy of the dewatering and excavation plan or for furnishing all equipment, labor and materials necessary for performing the various parts of the Work. If, during the progress of the Work, it is determined by the Owner's Representative the dewatering system and excavation plan are inadequate or the Contractor's plan of construction is inoperative, the Contractor shall, at his expense, furnish, install, and operate such additional dewatering equipment and make such changes in other features of the plan or operation as may be necessary to perform the Work in a manner satisfactory to the Owner.

Monitor settlement and groundwater levels around existing structures during dewatering. Keep and evaluate daily records of settlement and groundwater levels. Notify the Owner's Representative immediately if excessive settlement or a significant drop in groundwater level is recorded.

Furnish standby equipment of sufficient size and capacity to insure continuous operation of the dewatering system as designed. Repair any damage or settlement to the foundation or other work or any existing structures caused by temporary or permanent failure or operation of the dewatering system to the satisfaction of the Owner at the Contractor's expense. The Contractor should consider the use of recharge systems or other methods of protecting of existing facilities. The Contractor will be required to perform the dewatering and to maintain the permanent work areas for the length of time as necessary for the Work under this contract. Upon completion of the dewatering and control of water operation, remove all temporary works and dewatering facilities in a manner satisfactory to the Owner.

Dispose of water from dewatering operations in a suitable manner in conformance with the National Pollutant Discharge Elimination System (NPDES) Permit, as approved by the applicable region of the Regional Water Quality Control Board (RWQCB).

Groundwater may be disposed of in the Plant headworks upon receipt of approval from the Owner or Owner's Representative. Comply with Owner's flowrate requirements for flow and water quality.

X. Waterway Protection: Enforce strict on-site handling rules to keep construction and maintenance materials out of receiving waters, including, but not limited to:

1. Store all reserve fuel supplies only within the confines of a designated construction staging area.
2. Refuel equipment only within designated construction staging area.
3. Regularly inspect all construction vehicles for leaks.

Clearly mark and stake on the ground the construction and staging areas shown on the Plans. Heavy equipment use outside this area shall be prohibited. The construction staging areas must be designed to contain contaminants such as oil, grease, and fuel products, so they do not drain towards receiving waters or storm drain inlets. If heavy-duty construction equipment is stored overnight adjacent to a potential receiving water, drip pans must be placed beneath the machinery engine block and hydraulic systems.

Construct a silt fence around disturbed soil areas and take all measures necessary to prevent erosion and transport of sediment into a waterway in accordance with a project Stormwater Pollution Prevention Plan. Stockpile excavated material within the construction staging area and cover stockpiles with plastic sheets to prevent erosion.

1.11 FUGITIVE DUST

A. Employ dust control measures to Owner's satisfaction throughout the project duration. Dust control operations shall prevent construction dust from harming or annoying persons living in or occupying buildings near Work. Do not allow fugitive dust to be visible beyond Owner facilities' property lines.

B. Use reasonable and typical watering and dust preventative techniques to reduce fugitive dust emissions. Furnish all labor, equipment, and means required (including watering or soil binders) and carry out effective measures wherever and as often as necessary to prevent its operation from producing dust in amounts damaging to property, cultivated vegetation, or domestic animals; or that are causing a nuisance as determined by the Owner. All unpaved demolition and construction areas shall be wetted as necessary during excavation and construction, and temporary dust covers shall be used to reduce dust emissions.

C. Cover or wet loads of excavated material or rubbish leaving site or of material being imported to prevent blowing dust.

D. Spread soil binders on site, unpaved roads, and parking areas when needed to control dust and wind-blown particles from causing a nuisance or violating air quality standards.

E. Submit a dust control plan and obtain the Owner's approval before beginning work off paved roads or any activity that could stir up dust.

1.12 ENGINE EMISSIONS

A. Comply with all laws, ordinances, rules, regulations, and orders pertaining to air pollution.

B. During construction, trucks and vehicles in loading or unloading queues shall be kept with their engines off, when not in use, to reduce vehicle emissions. Polluting construction activities shall be phased and scheduled to avoid emissions peaks.

C. Maintain equipment engines in proper tune and operate construction equipment so as to minimize exhaust emissions. Do not discharge air pollutants (dust, smoke, or other air contaminants) into the atmosphere in such quantities that they will cause a violation of the regulations of any legally constituted authority.

D. Visible emissions from any engine shall not be as dark as or darker than No. 1 in the Ringleman Chart for a period or periods aggregating more than three (3) minutes per hour.

1.13 PORTABLE ENGINE-DRIVEN EQUIPMENT

A. Comply with the air quality regulations pertaining to portable engines with rated horsepower of 50 bhp or greater and other applicable portable equipment by meeting the following minimum requirements:

1. The engines or other applicable portable equipment shall have an air quality permit or be registered with CARB.
2. The engines furnished shall satisfy the latest applicable emissions standards, as set forth in Title 13 of the California Code of Regulations (Article 5, Sections 2450-2466) and Title 40 of the Code of Federal Regulations, Part 89.

B. The engines shall be equipped with a non-resettable elapsed operating time meter. Activity reports shall be submitted to regulators as required.

C. Portable engines and other portable equipment that are permitted with the appropriate regulatory authorities and shall meet the following minimum requirements:

If any of the Contractor or subcontractor engine or equipment is to be located at Owner facilities for more than twelve (12) consecutive months, provide the Owner with all information necessary for Owner to revise its Title V operating permit. This information shall include, but is not limited to, detailed equipment description, specifications, emissions information, dispersion modeling, permits, registrations, monitoring records, and source tests reports required by the permit for the subject equipment. Submit this information to the Owner no later than the end of the sixth month the equipment is located at Owner facilities. If the Contractor fails to provide the specified information in the specified time frame, the Contractor shall bear all fees, costs, and penalties including, but not limited to, filing fees, attorney fees, fees associated to acquire necessary offsets, fees for excessive emissions, etc. associated with Owner obtaining necessary variances from SCAQMD.

1.14 FUELING OF ENGINE-DRIVEN EQUIPMENT

A. Provide responsible personnel in direct control of all vehicle and equipment fueling operations at all times to prevent fuel spills. All fueling must be continually monitored at all times.

1.15 RECORDS OF VOLATILE ORGANIC COMPOUNDS

A. Maintain usage records of volatile organic compound (VOC) materials according to SCAQMD Rule 109 and pay annual fees according to Rule 301. The usage records shall contain, at the minimum, the following information:

1. Manufacturer's Name
2. Product Name/Number
3. Quantity (in gallons)
4. VOC Content (in lb/gal)
5. California Code section

1.16 SAFETY AND HEALTH REGULATIONS

A. Comply with Safety and Health Regulations for Construction, promulgated by the Secretary Standards Act, as set forth in Title 9, C.F.R. Copies of these regulations may be obtained from Labor Building, 14th and Constitution Avenue NW, Washington, DC 20013.

B. Comply with the provisions of the Federal Occupational Safety and Health Act, as amended, and with all applicable State of California, Department of Industrial Relations, Construction Safety Orders (Cal-OSHA) requirements.

C. Comply with all federal, state, and local laws, regulations, and requirements for handling and storage of chemicals.

D. Wear hardhat, safety vest, safety glasses, and steel toe shoes at all times while at Owner-owned properties and facilities.

E. Monitor for explosive gas levels.

F. Confined Spaces:

1. The Contractor's attention is directed to the General Industry Safety Orders of the State of California Article 108, Confined spaces, Section 5157. (Title 8 of California Code of Regulations, Sections 5156, 5157, and 5158.)
2. The Contractor shall retain a copy of said regulations on the worksite.
3. State law and Owner's policy on confined spaces require a two-week advance notification from the Contractor for work within confined spaces, submittal of Contractor's confined space work procedures and rescue plan, compliance with Entry Permit procedures, participation in a hazard assessment review of planned precautions and a debriefing upon completion of the confined space operation. Compliance with the General Industry Safety Orders remains the Contractor's responsibility and Owner review is for general compliance and coordination only.
4. This notice is provided for bidding purposes. In accordance with the General Industry Safety Orders, Section 5157(c)(8), Owner will provide available information to the Contractor for each confined space location.

1.17 CONFINED SPACE WORK AREA(S)

A. Work areas for which entry is expected to be in accordance with Section 5157 (c)(5), Non-Permit required Confined Spaces;

B. Work areas in which hazardous or potentially hazardous atmospheric conditions exist or may exist shall be in accordance with Section 5157 (d), (e) and (f) (Permit-Required Confined Space):

1. Manholes
2. Sewer pipes
3. Tanks
4. Vaults

It is the Contractor's obligation to satisfy all requirements of Title 8, CCF 5157.

Attention is also directed to "Sewer System Entry", Appendix E to CCF 5157.

NOTE: A permit required confined space may be reclassified by Owner Safety staff to a non-permit required confined space at the Contractor's expense through the provisions set forth in 5157 (c)(7), or a listed non-permit required work area may become a permit required confined space work area.

The importance of working safely in confined spaces cannot be over emphasized. Due to the continuous flow of sewage and contaminant that may be contained therein, the atmosphere may suddenly and unpredictably become lethally hazardous. Where there is conflict between applicable safety orders, laws and regulations and policies, the more stringent measures shall apply.

C. Job Hazard Analysis: Comply with the provisions of the Hazards Communication Act (Section 5194, Title 8-CAC). If hazardous substances are to be utilized or handled in the course of the Contractor's activities, before commencing each task conduct a job hazard analysis for the Owner. The analysis shall document the following:

1. Hazard communications program.
2. Safety precautions for all persons who may be exposed to hazardous substances utilized by the Contractor as presented in the Construction Safety Plan.
3. Number of people to be involved in the Work.
4. Written verification that all safety measures will be carried out.
5. Written verification that required safety equipment is available.

D. Be especially careful to avoid fire hazards in all welding, cutting, and equipment fueling. Furnish all safety devices, fire extinguishers and fire watch personnel required to protect the Work and provide for worksite and public safety.

E. Excavation Plans for Worker Protection Required by California Labor Code Section 6705:

1. The specifications require that all excavations be performed, protected, and supported as required for safety and in a manner set forth in the operation rules, orders, and regulations prescribed by the CAL/OSHA Construction Safety Orders.

2. Submit to Owner for acceptance, in advance of excavation, a detailed plan showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of any trench or trenches five (5) feet or more in depth. The plan shall be prepared and signed by a California registered civil or structural engineer as required by all applicable laws including CAL/OSHA construction safety orders. As a part of the plan, a note shall be included stating the registered civil or structural engineer certifies the plan complies with the CAL-OSHA Construction Safety Orders, or that the registered civil or structural engineer certifies the plan is not less effective than the shoring, bracing, sloping, or other provisions of the Safety Orders.

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

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

5. Nothing contained in this section shall be construed as relieving the Contractor of the full responsibility for providing shoring, bracing, sloping, or other preventive measures which are necessary for worker protection, nor for the liability resulting from the failure to do so.

1.18 EXCAVATIONS BELOW FOUR (4) FEET

A. If any work required by this Contract includes digging trenches or other excavations extending deeper than four (4) feet below the surface, promptly, and before any of the following earth conditions are excavated, moved or otherwise disturbed, notify Owner, in writing, of its findings, including, but not limited to:

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

2. Subsurface or latent physical conditions at the site differing from those indicated on the Plans;

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

Nothing in this section is intended to relieve the Contractor of the responsibility to fully examine the Contract Documents and the site where the work is to be performed in accordance with the General Conditions; to be familiar with all local conditions and federal, state, and local laws, rules and regulations that may affect the performance of any work; to study all surveys and investigative reports about subsurface and latent physical conditions pertaining to the worksite; to

perform such additional surveys and investigations as the Contractor deems necessary to complete the work at the bid price; and to correlate the results of all such data with the requirements of the Contract Documents.

If Owner determines that hazardous waste exists and that conditions exist which the Contractor could not discover through reasonable investigations herein, Owner shall notify the Contractor and the Contractor may request a Change Order in accordance with the Contract Documents. Nothing in this section shall relieve the Contractor of the obligation to pay all fees and costs associated with removal and cleanup of any hazardous waste used at, or brought to, the worksite by the Contractor, nor shall this section relieve the Contractor of responsibility for site conditions discoverable by any investigation herein.

In the event a dispute arises between Owner and the Contractor involving hazardous waste and whether site conditions differ materially from those the Contractor could or should have discovered by the investigations required by these Contract Documents, the Contractor shall not be excused from the scheduled completion date provided in the Contract Documents and shall proceed with all work in the manner and in the time required by the Contract Documents.

1.19 SITE SECURITY

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

B. Employ security staff as needed to provide the required security and prevent unauthorized entry.

C. Contractor shall make no claim against the Owner for damage resulting from trespass.

D. Party responsible for security shall make good all damage to property of Owner and others arising from failure to provide adequate security.

E. If existing fencing or barriers are breached or removed for purposes of construction, Contractor shall provide and maintain temporary security fencing equal to the existing in a manner satisfactory to the Owner.

F. Protect temporary and permanent openings to prevent intrusion by unauthorized persons. Bear responsibility for protection of plant and material on site of the work when openings are not closed. Provide temporary fencing around construction staging area. Fence temporary openings when openings are no longer necessary.

G. During night hours, weekends, holidays, and other times when no work is performed at site, provide temporary closures or enlist services of security guards to protect temporary openings.

H. Install and maintain for the duration of construction a remotely monitored site surveillance system to include video cameras mounted on temporary poles. Install surveillance system to provide full video surveillance of site with connection to monitoring station where police can be notified when unauthorized activity occurs.

I. Maintain security program throughout construction until Owner's acceptance and occupancy precludes need for Contractor's security program.

J. All costs for security as specified in this Section shall be borne by the Contractor.

1.20 SPILL PREVENTION AND EMERGENCY RESPONSE PLAN

A. The Contractor is responsible for preventing, containing, and cleanup of any sewage spillage. For any Project that involves the public sewer system, the Contractor shall develop a written "Spill Prevention and Emergency Response Plan (Plan)". The Plan shall be submitted to the Owner per Section 01300. The Owner will review the Plan for conformance with the following instructions. The Plan shall be submitted a minimum of 10 working days prior to commencement of construction, and the Contractor shall not start construction until the Plan has been reviewed by the Owner and accepted.

B. The Spill Prevention and Emergency Response Plan shall be developed to respond to any construction related sewage spill(s).

C. This plan shall include the following but not limited to these topics:

1. Develop an emergency notification procedure. This includes an emergency response team roster with telephone numbers and arrangements for backup personnel and equipment, and an emergency notification roster of the designated Agency representatives. The Contractor shall designate primary and secondary representatives, their respective landline phone and cell phone numbers. The Contractor's representatives shall be accessible and available at all times, 24 hours per day, to respond immediately to any sewer spill event.

2. Develop an emergency response unit that shall be able to dispatch to the site twenty-four (24) hours a day seven (7) days a week including weekends and holidays. Make arrangements for an emergency response unit, stationed at or near the job site, comprised of emergency response equipment and trained personnel to be immediately dispatched in the event of a sewage spill(s). This unit may also include field biologists and/or archaeologists if the Work is in an environmentally-sensitive area such as a canyon.

3. The Contractor shall describe how it will furnish all necessary materials, supplies, tools, equipment, labor, and other services for spill containment and cleanup.

4. Identify all nearby environmentally-sensitive areas such as waterways, channels, catch basins and entrances to existing storm drains.

5. Identify any property owners who may be affected.

D. In case of a sewage spill(s), the Contractor shall act immediately without instructions from the Agency, to control the spill and take all appropriate steps to contain it in accordance with the "Spill Prevention and Emergency Response Plan".

E. The Contractor shall immediately notify the Owner, as well as the Owner's Representatives listed on the emergency contact list. The Contractor shall describe the nature of the spill, describe all actions taken and shall report the Project name, location, and names of the Contractor(s) involved.

F. The Contractor shall, within one (1) working day from the occurrence of the spill, submit to the Owner a written report describing the following information related to the spill:

1. The location of the spill.

2. The nature and estimated volume of the spill and volume of sewage recovered.

3. The date and time of the spill.

4. The duration of the spill.

5. The cause of the spill.

6. The volume of sewage entering the storm drain system, if any.

7. The type of remedial and/or clean up measures taken (including erosion control measures) and the date and time of implementation.

8. The corrective and/or preventive actions taken to avoid the possibility of a recurrence.

9. The equipment used in spill response.

10. The environmentally-sensitive habitat such as a water body, if any, impacted.

11. The results of any necessary monitoring and/or sampling.

12. A list of who from the Agency was notified, and date / time of notification.

13. The date and time Contractor was notified of the spill.

14. The date and time Contractor arrived on site.

15. Incident photographs or videos

G. The Contractor shall exercise care not to damage existing public and private improvements, interrupt existing services and/or facility operations that may cause a sewage spill. Any reasonably anticipated utility and/or improvement damaged by the Contractor shall be immediately repaired at the Contractor's expense. If the construction operations damage an existing utility or damage or interrupt an existing service that causes a sewer spill, the Contractor shall immediately notify the Agency representatives.

H. The Owner may institute further corrective actions, as deemed necessary, to fully comply with existing laws, ordinances, codes, order or other pertinent regulations. The Contractor shall be responsible for all costs incurred for the corrective actions including mitigation measures (habitat restoration, etc.) and obtaining after-the-fact permits if necessary, in environmentally sensitive areas. These permits may include, but are not limited to, those from the California Coastal Commission, U. S. Army Corps of Engineers, Regional Water Quality Control Board and the California Department of Fish and Wildlife.

I. It shall be the Contractor's responsibility to assure that all field forces, including Subcontractors, know and obey all safety and emergency procedures, including the Spill Response Plan. All safety and emergency procedures applicable to the Work, shall be maintained and followed at the job site. If in an environmentally sensitive area, such as canyon, stream, or lagoon, the impacts must be minimized. Crews must be aware at the start of the job of any sensitive environmental habitats, breeding season restrictions, etc.

J. The Contractor shall take extreme care to prevent spills when working on sewer lines such as when making a temporary connection and when connecting new lines into the sewer system. The Contractor shall prepare a step by step written tie in/connection plan with a time table for each step. The plan shall be submitted to the Owner per Section 2-5.3 Submittals for approval prior to execution. The Contractor shall not trap debris and discharge rock or debris downstream in the sewer. Avoidance of streams is paramount unless authorized via permits.

K. If a sewer bypass is called for in the Plans and/or Specifications or is needed to construct the Project, the Contractor is responsible for continuously monitoring the flow levels downstream and upstream of the construction location. This will allow the Contractor to make the earliest possible determination of a system failure that may result in a sewage backup and spill. The Contractor shall include the means and methods of monitoring the flow in the Spill Prevention and Emergency Response Plan.

L. The Contractor is responsible for the recovery and legal disposal of any spilled sewage and liability arising from negligently causing a sewage spillage and shall defend, indemnify, protect, and hold harmless the Agency, its agents, officers, and employees, from and against all claims asserted, or liability established for damages or injuries to any person or property resulting from any sewage spill caused or claimed to be caused by the Contractor's action or failure to take measures to prevent a spill. The Contractor shall also be responsible for payment of any fines and/or penalties assessed against the Agency for such sewage spills. The Contractor's duty to indemnify and hold harmless shall not include any claims or liability arising from the established sole negligence or willful misconduct of the Agency, its agents, officers or employees.

M. Contractor shall include all costs associated with the requirements for "Spill Prevention and Emergency Response Plan" in his/her bid including preparation and acceptance of a plan and execution of plan during an emergency response.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01730

RECORD DRAWINGS

PART 1 - GENERAL

1.01 GENERAL

A. The Contractor shall provide the Owner's Representative neat and legibly marked contract drawings showing the final location of piping, equipment, electrical conduits, utility boxes, vaults, and cables, and other components of the work. Marking of the drawings shall be kept current and shall be done at the time the material and equipment are installed. These drawings shall be available to the Owner's Representative. Final payment shall not be made until the marked-up record drawings are delivered to and approved by the Owner's Representative.

B. Record Drawings and Record Project Manual shall include all changes in the Plans including those issued as Change Orders, Plan Clarifications, Addenda, Notice to Bidders, responses to Requests for Information, Jobsite Memos, and any additional details needed for the construction of the Project but not shown on the Plans. Any substructures encountered while excavating that are left in place shall be located by survey, to the satisfaction of the Owner's Representative, shown, and identified on the Record Drawings. All substructures including, but not limited to, concrete structures, electrical conduit and duct banks, drains and sanitary sewer pipelines, process piping, water lines, etc., whose installed location differs from that shown on the original Plans shall be precisely located by survey to the satisfaction of the Owner's Representative and recorded on the As-Built Drawings before backfilling

1.02 MAINTENANCE OF DOCUMENTS

A. The following shall be maintained in the Contractor's field office in clean, dry, legible condition: Contract Drawings, Specifications, Addenda, approved Shop Drawings, Samples, photographs, Change Orders, other Modifications of Contract, test records, survey data, Field Orders, and all other documents pertinent to the Contractor's Work.

B. The above mentioned items, including those of all Subcontractors, shall be kept by the Contractor in the Contractor's Jobsite office, shall be updated during construction, and shall be available for the Owner's Representative's inspection and copying at all times. The Owner's Representative will review the Record Drawings prior to submittal of all Monthly Payment Requests. If, in the opinion of the Owner's Representative, the Record Drawings are not current, approval of the Monthly Payment may be withheld until the drawings are made current. In addition, the Contractor shall submit with each Monthly Payment Request, a digital scan at adequate resolution and in PDF format of the current Record Drawings, and a signed certification stating that all Record Drawings are complete and accurate as of the date of the payment request.

C. Documents shall be available at all times for inspection by the Owner's Representative.

D. Record documents shall not be used for any other purpose and shall not be removed from the office without Owner's Representative's approval.

E. Where the Plans are diagrammatic or lacking precise details, the Contractor shall produce dimensioned full size sheets as the Record Drawings. For installations outside of structures, the

locations shall be given by coordinates and elevations. Where substructures are encased in concrete, the outside dimensions of the encasement shall also be given.

F. In the case of those Drawings which depict the detail requirements for equipment to be assembled and wired in the factory, the Record Drawings shall be updated by indicating those portions which are superseded by final Shop Drawings, and by including appropriate reference information describing the Shop Drawings by manufacturer, drawing and revision numbers.

G. The Contractor may submit additional 24 X 36 sheets detailing record work as approved by the Owner's Representative.

H. The Contractor shall not conceal any work until the required record drawing information has been recorded. The Owner's Representative may direct the Contractor to expose concealed work if work was not recorded on the Record Drawings.

I. At the Completion of the Work and after Final Inspection, the Contractor shall copy its Record Drawing (as installed) data, using red ink, onto a new set of high quality prints. The Contractor shall certify to the completeness and accuracy of the "as installed" information indicated on the prints with signature. The Contractor shall then deliver as a submittal to the Owner 's Representative, for review and approval, both the field developed prints and the final signed prints as a condition precedent to the Owner's release of any retained funds.

1.03 PHOTOGRAPH REQUIREMENTS

A. Provide construction progress photographs of all work to be buried or hidden including:

1. Piping;
2. Pipe connections, valves, fittings, and equipment;
3. Conduits, duct banks;
4. Reinforced concrete footings, walls, and foundations with reinforcing steel in place prior to concrete placement; and
5. Other items as directed by the Owner's Representative

B. Provide construction site, electrical, and mechanical progress photographs taken not less than weekly showing the progress of the Work.

C. Provide photographs taken by a professional photographer of the completed project, minimum 100 photos, as directed by the Owner's Representative.

D. Use digital photography.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01900

PERMITS AND OTHER REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The Contractor is responsible to obtain all local, state and federal permits and licenses required to perform the work. Payment for obtaining and complying with permits and licenses including, but not limited to, general construction permits, building permits, encroachment permits, haul route permits, excavation permits, drilling permits, water discharge permits, temporary easements, licenses, inspection fees, and Federal, State and local taxes shall be borne by the Contractor and shall be included in prices bid for work for which such costs are appurtenant.

B. The Contractor shall provide a copy of the permit or license to the Agency prior to performing the work requiring the permit or license.

C. The Contractor shall comply with the Draft Environmental Impact Report. The Mitigation Monitoring and Reporting Program (MMRP) requirements are hereby made a part of the Construction Documents, by reference. By submitting a bid proposal, the Bidder is acknowledging that he/she has reviewed the requirements of the environmental mitigation measures, agrees to comply with said measures, and confirms that all costs associated with compliance have been included in his/her bid proposal.

No time extensions or consideration will be given for non-receipt or other circumstances associated with the review or acquisition of this document.

1.02 GENERAL

A. The Contractor shall obtain, pay for, and comply with required permits, licenses, work permits, and authorizations from appropriate agencies, including the following:

1. State and Federal permits
    a. Excavation and Dirt Moving Permit from Cal OSHA
    b. Safety permit from California Division of Industrial Safety
    c. NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities
    d. Tree removal permits
    e. NPDES Permit for discharge of hydrostatic test water and potable water
2. Other permits
    a. Regional Board Permit
    b. Air Quality Permit
    c. Building Permit
    d. Written authorization from private property owners for property utilized for staging

B. Contractor shall pay for all fees applicable to Contractor’s operations.

1.03 ENVIRONMENTAL COMPLIANCE

A. The Contractor shall maintain a copy of the MMRP on the project site at all times and shall be fully aware of the mitigation measures as they affect the work.

B. The Contractor is responsible for compliance with all measures in the "Mitigation, Monitoring and Reporting Program." The procedures presented in Part 3 of this specification are provided to clarify implementation of specific measures.

C. The Contractor shall be responsible to the Agency for costs incurred by the Agency, including, but not limited to, fines, penalties, or settlements, arising from the Contractor's failure to comply with the mitigation measures. Any such costs will be deducted from the Contractor's payment in accordance with the procedures in the General Provisions.

PART 2 - MATERIALS (NOT USED)

PART 3 - EXECUTION

3.01 STORM WATER POLLUTION PREVENTION PLAN (SWPPP) / GENERAL PERMIT

A. During all phases of construction, the CONTRACTOR shall perform the work in a manner which will minimize soil erosion and prevent water pollution from site runoff by utilizing the following:

1. Proper scheduling of work and careful construction practices.
2. Grading disturbed surfaces to provide positive drainage and prevent ponding of water.
3. Installing desilting basins, gravel bag dikes, silt fences and other erosion control measures to prevent sediment escape from the construction site and to maintain runoff quality.

B. The Contractor shall conform to all applicable local, State and Federal regulations and laws pertaining to water pollution control. The Contractor shall conduct and schedule its operations, and follow and implement Best Management Practices (BMP) in such a manner as to prevent water pollution. The Contractor shall also conform to the following requirements:

1. Sediments shall not be discharged to a storm drain system or receiving waters.
2. Sediments generated on the work site shall be contained on the work site using appropriates BMP's.
3. No construction related materials, waste, spill, or residue shall be discharged from the work site to streets, drainage facilities, receiving waters, or adjacent property by wind or runoff.
4. Non-storm water runoff from equipment, vehicle washing, or any other activity shall be contained within the work site using appropriate BMP's.
5. Erosion shall be prevented. Erosion susceptible slopes shall be covered, planted or otherwise protected in a way that prevents discharge from the work site.

C. The CONTRACTOR shall contain and remove any and all waste or pollutants generated by the CONTRACTOR's construction operations using the appropriate Best Management Practices (BMPs) by preparing a SWPPP. The SWPPP shall be submitted for approval to the AGENCY and the appropriate regulatory agencies. The SWPPP shall be written, amended, and certified by a Qualified SWPPP Developer (QSD) in accordance with the General Permit.

D. The CONTRACTOR shall be responsible throughout the duration of the construction period for installing and maintaining the applicable BMPs and for removing and legally disposing of temporary control measures, wastes and pollutants at an off-site location. The CONTRACTOR shall ensure all BMPs and temporary control measures required by the General Permit and the SWPPP are implemented by a Qualified SWPPP Practitioner (QSP) in accordance with the General Permit. Unless otherwise directed by the AGENCY or specified elsewhere in these specifications, the CONTRACTOR's responsibility for BMP implementation shall continue throughout any temporary suspension of work.

E. The CONTRACTOR is responsible for all treatment necessary to ensure water is disposed of in a legal manner.

F. In accordance with the General Permit and the SWPPP, the CONTRACTOR shall develop a Rain Event Action Plan (REAP) within 48 hours prior to any likely precipitation event.

G. The Contractor shall ensure all storm water and erosion control measures required by the General Permit and the SWPPP are implemented by a QSP in accordance with the General Permit.

H. Conformance with the provisions of this section shall not relieve the CONTRACTOR from the CONTRACTOR's responsibilities of the Contract Documents.

I. If solid or liquid materials or waste, hazardous or otherwise, or pollutants originating from the CONTRACTOR's operation enter the storm drain system or water courses, the CONTRACTOR will be required to thoroughly clean up the affected storm drain facilities and water courses to the satisfaction of the AGENCY. If the CONTRACTOR fails to clean up the affected facilities as required, the AGENCY will issue a stop-work order and take necessary actions to ensure the cleanup of the affected facilities.

J. The CONTRACTOR shall be responsible for all costs, including fines, the AGENCY's cost of defense, the cost of cleanup by others ordered by the AGENCY, and liabilities imposed by law as a result of the CONTRACTOR's failure or negligence in complying with the requirements specified herein.

K. Amendments or changes to the SWPPP shall be performed by the CONTRACTOR and QSD and are a requirement of the Contract Documents. The cost for implementing and maintaining the General Permit conditions and SWPPP and BMP requirements shall be included in the cost of the construction; no additional compensations shall be given to meet or amend the SWPPP.

3.02 BMP MAINTENANCE

A. To ensure proper implementation and effectiveness of the BMPs, the CONTRACTOR shall regularly inspect, maintain, repair and/or replace the deployed BMPs throughout the construction site. The CONTRACTOR shall identify corrective actions and the time needed to address any deficient BMPs or reinitiate any BMPs that have been discontinued. The CONTRACTOR shall keep written records of all BMP inspections, maintenance, and corrective actions.

B. If the CONTRACTOR or the AGENCY identifies a deficiency in the deployment or functioning of a BMP, the deficiency shall be corrected immediately. If requested by the CONTRACTOR and approved by the AGENCY in writing, the deficiency may be corrected at a later time or date, but the corrective action shall not be later than the onset of the subsequent rain event. The correction of deficient BMPs shall be at no additional cost to the AGENCY.

END OF SECTION

SECTION 02000

SITEWORK GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 CONNECTIONS TO UNDERGROUND UTILITIES, CONDUITS, OR PROCESS PIPING

A. Contractor shall obtain best available current information on location, identification and marking of existing utilities, piping and conduits and other underground facilities before beginning any excavation. In areas where utilities that participate in Underground Service Alert may occur, call 800-422-4133 for information at least 48 hours in advance of beginning work. Give Owner 24 hours' notice before beginning work.

B. The location of existing utilities and underground facilities known to the Owner and/or Engineer are shown in their approximate location based on information available at the time of preparing the Drawings and/or Specifications. The actual location, size, type and number of utilities and underground facilities may differ from that shown and utilities or underground facilities may be present that are not shown. See General Conditions for the contractor's responsibilities and for differing conditions that warrant a change in Contract Price.

C. Use extreme care when excavating or working in areas that may contain existing utilities, process piping, conduits or other underground facilities. Use careful potholing, hand digging and probing to determine the exact location of underground installation. Some locations contain multiple pipes or conduits. Prior to performing any subsurface work, investigate, determine and prepare a plan to turn off or disconnect each utility believed to be within 100 feet of the subsurface work in the event of an accidental breach of a utility conduit.

D. Where connections to existing utilities or other underground facilities is required or where new piping or conduits may cross or interfere with existing utilities or underground facilities carefully excavate and uncover existing installations to a point 1 foot below the pipe or conduit to determine the actual elevation and alignment. Call the Owner's attention to differing existing conditions that may require a clarification or change.

E. Shutdown of existing utilities, services or operations shall be done in accordance with Section 01100 and 01142.

F. Coordinate electrical service connections with City.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 02010

GEOTECHNICAL INVESTIGATION

PART 1 - GENERAL

1.01 INVESTIGATIONS

A. Subsurface exploration performed for the project in 2023 by BSK Associates, 399 Lindbergh Avenue Livermore, CA, 94551; Phone number 925-315-3151. These investigations are provided for reference and information and are presented in the following geotechnical report:

Geotechnical Investigation Report
Chemical System Upgrade
Ellis Creek Water Recycling Facility
Petaluma, California
Dated June 27, 2023
BSK File No. G00000357

B. By submitting a bid, the bidder is deemed to have examined the above referenced report, and is familiar with the findings, recommendations, and conclusions contained therein, and has included with his bid all costs associated with groundwater control and dewatering, earthwork and excavation requirements including, but not limited to, sheet piling, shoring and bracing, and underpinning of existing facilities as required, and of fill, over-excavation, and compaction requirements. It shall be the responsibility of the Contractor to make provisions for earthwork and excavation including, but not limited to, sheet piling, shoring, bracing, underpinning, fill, and compaction required as a result of soil conditions that differ from those reported in the geotechnical report referenced above.

It shall be the responsibility of the Contractor to determine, allow for and control the groundwater at the date of project construction. All groundwater control and dewatering for construction purposes shall be the responsibility of the Contractor and no additional compensation will be forthcoming.

C. All unstable or unsuitable material shall be removed, disposed and replaced with suitable excavated compacted select fill or imported select fill (unclassified fill) per the recommendation of a licensed Geotechnical Engineer in the State of California provided by the Owner, the soils report and these Specifications, or as directed by the Owner.

D. All grading, excavation, fill, compaction, and backfill for footings, shall be performed under inspection by a California licensed Geotechnical Engineer provided by the Owner.

E. All sheeting, shoring, and underpinning operations shall be performed under the direction of a California licensed Geotechnical Engineer provided by the Contractor.

1.02 ADDITIONAL SUBSURFACE EXPLORATION

Any additional subsurface exploration required by the Contractor shall be conducted at the Contractor's expense.

1.03 SUBMITTALS

The Contractor shall submit design calculations and drawings in accordance with these Specifications signed by a Registered Civil Engineer licensed in the State of California for all trenching, shoring, sheet piling, bracing and underpinning activities prior to commencement of such work.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 02050

CLEARING, GRUBBING, AND DEMOLITION

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section includes materials, installation standards, and Contractor responsibilities associated with the furnishing of all labor, materials, equipment and incidentals required to properly perform clearing and grubbing as shown on the Drawings and as specified herein. Such work includes but is not limited to the following:

1. Perform all clearing and grubbing necessary and required
2. Site Clearing
3. Demolition

1.02 RELATED WORK

A. Sitework General Requirements - Section 02000

B. Site Preparation, Excavation and Earthwork – Section 02200

1.03 PROTECTION

A. Streets, roads, adjacent property and other works to remain shall be protected throughout the work as defined in the General Conditions.

1.04 REQUIREMENTS OF REGULATORY AGENCIES

A. State and local code requirements shall control the disposal of cleared materials.

1.05 DEMOLITION

A. Provide all demolition required to perform the work covered under this contract including without limitation:

1. Remove existing construction as shown or identified to be removed.
2. Remove and replace existing construction and/or finishes as required to provide access to perform other work included in this contract.
3. Include removal of mechanical and electrical work that is to be abandoned and is contained in construction to be removed whether or not the mechanical and electrical work is shown. Disconnect and cap off utilities in accordance with applicable codes and safety regulations.
4. Where utilities that are not shown pass through construction that must be removed, and those utilities serve other areas notify the Owner before disrupting service. If rerouting is required to maintain service, the Owner may issue a Change Order to accomplish the required work.
5. Store and protect items intended for reuse.

6. Assume ownership of debris and unwanted materials, remove from the site, and dispose of legally. Remove rubbish and debris so as not to allow accumulation at the site.

7. Include the cost of removing and disposing of hazardous material including without limitation asbestos or asbestos-containing material, lead-containing paint, and PCBs. If the presence of a hazardous material is suspected, have material tested. If material is identified as hazardous, retain qualified and licensed specialist to remove and dispose of it legally.

8. If illegal electrical wiring is encountered such as "BX" or nonmetallic sheathed cable, notify the Resident Engineer.

1.06 COORDINATION

A. Do not begin demolition until authorization has been received from the Owner's Representative.

B. The Contractor shall notify the Owner's Representative when demolition and removal activities are complete.

1.07 QUALITY ASSURANCE

A. General: All work shall be performed in accordance with the local building codes, State Industrial Safety Orders and requirements of the Occupational Safety and Health Act (OSHA) requirements.

B. Maintenance of Plant Operation: Demolition must be scheduled to allow the facility to remain in continuous operation. No interruption in operation will be permitted without previous authorization from the Owner.

C. Noise and Dust Control

1. Contractor shall provide safeguards, including warning signs, barricades, temporary fences, warning lights, and other similar items that are required for the protection of all personnel during the demolition and removal activities.

2. Contractor shall maintain fences, barricades, lights, and other similar items around exposed excavations until such excavations have been completely filled.

3. Prevent spread of flying particles and dust. Contractor shall sprinkle rubbish and debris with water to keep dust to a minimum.

4. Provide temporary partitions to control dust and noise and exclude unauthorized persons.

5. Perform work in a manner to cause least disturbance to building occupants and least damage to work to remain.

6. Maintain adequate means of safe, clear egress for building occupants.

7. Employ all available techniques for construction noise abatement. Use remote, well-mufflered air compressors and noise suppressed pneumatic and electric tools.

D. Protection: Demolition shall be performed in such a manner as to not harm adjacent structures, utilities, systems, equipment, existing landscaping or natural vegetation. The Contractor shall assume full responsibility for such disturbance. All costs for such repair, rehabilitation, or modifications shall be incurred by the Contractor at no additional cost to the Owner.

1.08 WARNING

A. The Contractor is advised that work under this Section may be hazardous. The Contractor is to take all necessary precautions to ensure the safety of workers and property. Removal of and/or working in areas containing even minor amounts of hazardous material including without limitation, asbestos, lead-based paint, PCBs or other hazardous materials requires special precautions, knowledge and procedures. If hazardous material is suspected, notify the Resident Engineer.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 CLEARING

A. Vegetation, such as brush, grass, roots, and other deleterious material shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies, and the Geotechnical Engineer. The Geotechnical Engineer shall evaluate the extent of these removals depending on specific site conditions.

B. Contractor shall limit clearing activities to the area actually needed for construction and wherever possible to avoid clearing large trees, plant materials indicated to remain and natural habitat.

C. Limits of clearing shall be within the right-of-way, or easements obtained by the Owner.

D. Remove saplings, shrubs, bushes, vines and undergrowth within the limits of clearing to the heights above ground given in the following table:

1. Shrubs, bushes and trees under 6-inches in diameter: 3 inches
2. Vines and undergrowth: 2 inches
3. Weeds: To ground surface.

E. If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area.

F. As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) have chemical constituents that are considered to be hazardous waste. As such, the indiscriminate dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed.

3.02 GRUBBING

A. Limits of grubbing shall coincide with the limits of clearing.

B. Remove all stumps, roots over 4-inches in diameter, and matted roots within the limits of grubbing to a depth of 24-inches below existing ground surface. Engineering requirements shall control removal of stumps smaller than 4-inches in diameter under fills, foundations, or any construction in contact with the stumps.

3.03 REMOVAL OF CONSTRUCTION IN AREAS TO RECEIVE NEW WORK

A. Remove all unwanted mechanical and electrical work (whether shown or not) that is not wanted and is not needed to serve other areas that is in, on, or concealed behind work being removed. Cap off or terminate all mechanical or electrical work in accordance with the requirements of Divisions 15 and 16.

B. Protect mechanical and electrical work that serves other areas. Relocate concealed mechanical and electrical work that is required to preserve service to other areas.

C. Remove structural work designated for removal. Take precautions not to damage structural work intended to remain. Where temporary shoring is needed, submit a design prepared by an appropriately licensed engineer for review before proceeding.

D. If structural elements are encountered that were not shown, protect them from damage and report their presence to the Resident Engineer.

Where adjoining structures are to be kept in place, the demolition limit lines shall be neatly saw-cut. Sections to be removed shall be broken out, and the remaining face shall be chipped back to the saw-cut line. The Contractor shall do the necessary work to provide the remaining face with a finish compatible with the surrounding surfaces.

E. Pavement Removal: All pavements shall be saw-cut on a neat line at right angles to the curb face.

F. Electrical Equipment Removal: All electrical equipment, conduit, wiring, etc. to be removed shall be properly de-energized, made safe, and disconnected from all sources of power prior to demolition. All remaining electrical equipment, located within the demolition area, shall be labeled and indicated as energized.

3.04 REMOVAL OF LIMITED PORTIONS OF EXISTING CONSTRUCTION TO PERMIT MODIFICATIONS.

A. Provide careful, selective cutting and removal of existing construction as required to permit relocation or modification of partitions, doors, or openings. Cut and remove the least amount of work possible except when a larger area needs to be removed to permit strengthening existing construction or when required to remove finishes to a natural break line such as a corner or change in material.

B. Protect existing construction to remain with temporary coverings.

C. Treat existing mechanical, electrical or structural work as described in other parts of the Section.

D. When modifications are complete, replace removed work with new construction and finishes to match adjacent existing work. Standards of material and workmanship shall be in accordance with other portions of this Specification or if not covered then in accordance with current practice for this class of work. Salvaged materials may be used for replacement if in good condition.

3.05 REMOVAL OF EXISTING CONSTRUCTION TO PROVIDE ACCESS TO PERFORM WORK

A. Provide careful selective cutting and removal of existing construction where required to permit installation of new concealed mechanical or electrical work, or installation of equipment, fixtures or devices.

B. Treat existing mechanical, electrical or structural work as described in other parts of this Section.

C. Replace and/or patch removed construction and finishes in accordance with other parts of this Section.

3.06 PROTECTION

A. Protect all work to remain. Repair damage with materials, workmanship and finishes matching existing work when new.

B. Protect utilities that are to remain in service from damage.

C. Protect trees, plant growth, and features designated to remain as final landscaping. As a minimum, protection shall consist of physical barriers to prevent damage to trees, plant growth, and associated root systems.

D. Protect benchmarks, survey control points, and existing structures from damage or displacement.

E. Protect, from damage, living trees located more than 5 feet outside the construction lines of the project. Treat cut or scarred surfaces of trees or shrubs with paint prepared especially for tree surgery.

F. Maintain designated site access for vehicular and pedestrian traffic.

3.07 CUTTING HOLES IN CONCRETE AND/OR CONCRETE UNIT MASONRY

A. The Contractor is cautioned that electrical conduits and reinforcing that are not shown on drawings may be concealed in concrete CMU construction. Use electronic detection equipment to locate concealed items before cutting holes. Take all required precautions to avoid damage to existing conduits or reinforcing.

B. New openings in existing concrete walls or slabs may be saw cut to opening perimeter lines where drawings do not call for adding reinforcing trim bars to strengthen openings. Do not run saw kerfs past corners of openings. Complete concrete removal at opening corners by chipping and grinding. Take all required precautions to avoid water damage to existing construction or the Owner's property.

C. Where drawings or specifications call for adding reinforcing trim bars to strengthen openings, limit saw cutting to a depth of ¾-inch to avoid cutting existing reinforcing steel. Carefully chip out concrete to avoid damaging existing reinforcing steel which is to remain.

D. Use chipping guns to chip out small holes for pipes or conduits. Proceed carefully to avoid damage to concealed conduits. Core drilling is permitted only at the Contractor's risk and only with the Resident Engineer's permission. If core drilling is used, the Contractor shall: 1) use electronic detection equipment to locate conduit before drilling, 2) take precaution to avoid water damage to existing construction or the Owner's property, and) replace at its own expense, any damaged electrical or signal wiring or conduits.

3.08 SALVAGE

A. The Owner has the right to salvage any items scheduled for removal. The Contractor shall notify the Owner's Representative five (5) days prior to any salvage or demolition work to determine the disposition of items to be removed. The Owner's Representative will mark items to be

salvaged. Such items shall be properly disconnected, removed from their foundations, cleaned and stored at a location on the plant site as specified or as directed by the Owner's Representative.

3.09 BACKFILL REMOVED BURIED STRUCTURES

A. All removed buried structures, piping, duct banks, etc. shall be backfilled per the requirements of Section 02200 Site Preparation, Excavation, and Earthwork. All existing surfaces shall be restored.

3.10 REMOVAL AND DISPOSAL OF MATERIAL

A. Burning of materials on the site by the Contractor is NOT permitted.

B. Material to be removed shall be removed from the site daily as it accumulates.

C. Prior to depositing surplus material at any legal, off-site location, the Contractor shall obtain a written agreement with the owner of the property on which the disposal is proposed. The agreement shall state that the owner of the property gives permission for the Contractor to enter and responsibly deposit the material at no expense to the City. A copy of the agreement shall be furnished to the City.

D. Use debris chutes with covered tops emptying into covered containers.

E. Use rubber tired covered buggies with rubber bumpers to transport debris through occupied sections of buildings.

F. Store debris in suitable covered containers located where directed by the Owner and remove from site when full. Burning on the site is not permitted.

G. Removed material (other than the material to be reused) shall become the property of the Contractor who shall remove it from the site and dispose of it in a legal manner.

3.11 CLEAN-UP

A. The Contractor shall leave site in clean condition satisfactory to the Owner's Representative. Clean-up shall include but not be limited to disposal of all items, materials, debris and rubbish not required to remain property of the Owner.

END OF SECTION

SECTION 02140

DEWATERING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Materials, installation, maintenance, operation, and removal of temporary dewatering systems.

1.02 RELATED REQUIREMENTS

A. Section 01300, Submittal Procedures; Section 01730, Record Drawings; Section 02010 Geotechnical Investigation; Section 02050, Demolition; Section 02200, Site Preparation, Excavation and Earthwork; Section 02160, Sheeting, Shoring and Bracing; Section 15051, General Piping Requirements.

1.03 REFERENCES

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

State of California, Department of Transportation, Storm Water Quality Handbooks.

1. Construction Site Best Management Practices Manual.
2. Dewatering Manual.
3. Field Guide to Construction Site Dewatering.

1.04 SUBMITTALS

A. All submittals shall be submitted in accordance with Section 01300, “Submittal Procedures”.

B. Submit a working drawing and related supporting information detailing the proposed plan and methodology for dewatering, treatment, and disposal of accumulated water.

1. Identify the location, type and size of dewatering devices and related equipment.
2. The size and type of materials composing the collection system.
3. The size and type of equipment to be used to retain and treat accumulated water.
4. The proposed disposal locations.

C. Submit completed permits governing the disposal of groundwater from Agencies of Jurisdiction.

1.05 QUALITY ASSURANCE

A. The Contractor shall conduct a demonstration of its proposed system.

1. The Contractor shall provide verification that adequate personnel, materials, and equipment are available.

B. The Contractor shall maintain adequate control of the dewatering operation.

1. To ensure the stability of excavated and constructed slopes are not adversely affected by water.

2. To ensure that erosion is controlled.

3. To ensure that flooding of excavations or damage to structures does not occur.

C. Conducting the dewatering operation in a manner which will protect adjacent structures and facilities rests solely with the Contractor.

1. The cost of repairing any damage to adjacent structures and restoration of facilities shall be the responsibility of the Contractor.

1.06 DESIGN CRITERIA

A. Dewatering, treatment, and disposal of water shall be performed in conformance with all applicable local, state and Federal laws and permits issued by Jurisdictional Regulatory Agencies.

1. A permit is required from the Regional Water Quality Control Board for discharge of groundwater to surface waters.

2. Sewer systems shall not be used as drains for dewatering trenches or excavations, nor for disposal of collected or accumulated groundwater, without the approval of the Agency of Jurisdiction.

3. Groundwater shall not be applied to land without the approval of the landowner or the Agency of Jurisdiction.

PART 2 - PRODUCTS

2.01 MATERIALS

A. The Contractor shall provide piezometers for monitoring groundwater levels. The Contractor shall provide other instruments and measuring devices as required.

B. Piping, pumping equipment and all other materials required to provide control of surface water and groundwater in excavations shall be suitable for the intended purpose.

C. Standby pumping systems and a source of standby power shall be maintained on the site at all times.

1. The standby equipment shall be of reasonable size and quantity to prevent damage, should pumping equipment fail.

D. Dewatering equipment shall not cause noise nuisance.

PART 3 - EXECUTION

3.01 DESIGN REQUIREMENTS

A. The Contractor shall provide and maintain at all times during construction ample means and devices to promptly remove and dispose of all water from any source entering excavations or other parts of the work.

1. Dewatering shall be performed by methods that will ensure a dry excavation and preservation of the final lines and grades of the bottoms of excavations. Unless indicated otherwise by the Engineer or the Geotechnical Engineer, groundwater should be lowered and maintained at least 2 feet below the bottom of excavations in order to maintain the undisturbed state of the supporting soils and to allow proper compaction of backfill after below-grade structures and utility lines are installed.

2. Dewatering methods may include well points, sump points, suitable rock or gravel placed as pipe bedding for drainage and pumping, temporary pipelines, or other means, all subject to the approval of the Agency.

3. The cost of dewatering activities shall be borne by the Contractor.

3.02 DEWATERING OF EXCAVATIONS

A. The Contractor shall maintain an adequate system to lower and control the groundwater.

1. To permit excavation and construction of buried improvements.

2. To provide for placement of bedding and backfill materials.

3. To permit concrete work under dry conditions.

B. Sufficient dewatering equipment shall be installed to pre-drain the water-bearing strata below the bottom of excavations.

C. The hydrostatic head in water-bearing strata shall be reduced to ensure that the water level is below the bottom of the excavation at all times.

D. The system shall be placed into operation before excavation is started.

1. The system shall be operated continuously 24 hours a day, 7 days a week until the work is complete.

a. The excavated areas shall be kept free from water during construction.

b. Free from water while concrete is setting and achieving full strength.

c. Free from water until backfill has been placed to a sufficient height to anchor the work against possible flotation.

2. Flotation of facilities shall be prevented by maintaining a positive and continuous removal of water.

E. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, the affected areas shall be excavated and replaced with drain rock at no additional cost to the Agency.

F. If well points or wells are used, they shall be adequately spaced to provide the necessary dewatering.

1. They shall be sand packed and/or other means shall be used to prevent pumping of fine sands or silts from the subsurface.

2. A continuous check shall be maintained to ensure that the subsurface soil is not being removed by the dewatering operation.

G. Water and debris shall be disposed of in a suitable manner in compliance with permit requirements without damage to adjacent property.

1. No water shall be drained into work being built or other construction.

2. Before disposal, water shall be treated in accordance with permit requirements.

H. The release of groundwater to its original level shall be performed in a manner that avoids disturbance of natural foundation soils, prevents disturbance of compacted backfill, and prevents flotation or movement of structures and pipelines.

I. Upon completion of the dewatering and control of water operation, all temporary works and dewatering facilities shall be removed in a manner satisfactory to the Agency.

END OF SECTION

SECTION 02160

SHEETING, SHORING, AND BRACING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Support of temporary open excavations.

B. The Contractor shall be responsible for the design and selection of methods in conformance with the design criteria as specified herein.

1.02 RELATED REQUIREMENTS

A. Section 01300, Submittal Procedures

B. Section 01730, Record Drawings

C. Section 02010, Geotechnical Investigation

D. Section 02050, Demolition

E. Section 02200, Site Preparation, Excavation and Earthwork

F. Section 02223, Trenching, Backfilling and Compaction.

1.03 REFERENCES

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

1. ASTM A328 - Standard Specification for Steel Sheet Piling
2. ASTM A36 - Standard Specification for Carbon Structural Steel
3. Western Wood Products Association (WWPA)
4. West Coast Lumber Inspection Bureau (WCLIB)
5. International Building Code (IBC)

1.04 SUBMITTALS

A. All submittals shall be submitted in accordance with Section 01300, “Submittal Procedures”.

B. Submit the following information for Contractor’s proposed excavation support system for each construction component where excavation support systems will be used.

1. Arrangement and details for each excavation support system, supporting design calculations, and construction methods to be used for the installation and removal of each system.

2. Depths below the main excavation bottom elevation to which the support system will be installed.

3. Elevations of ground surface, struts, and shores, as applicable.

4. Permissible depth to which excavation may be carried before supports must be installed and preloaded.

5. Full excavation depth load to be carried by various support system members.

6. Bracing loads for various stages of excavation, bracing removal, and concrete placement.

7. Preloads as required.

8. For soldier piles, submit installation methods, connection details, bracing preloading, and jacking procedures.

9. Contingency plan for alternative procedures to be implemented if the excavation support system is found to perform unfavorably.

1.05 DESIGN REQUIREMENTS

A. The support of the excavation shall be designed by a California licensed Professional Civil or Structural Engineer, experienced in the design of excavation support systems. Stamped and signed Shop Drawings shall be submitted.

1.06 DESIGN CRITERIA

A. Shop Drawings with supporting calculations for the various excavation support systems shall be prepared in accordance with the following criteria:

1. Design the excavation support system and all components to support loads from:

    a. Earth pressures.

    b. Unrelieved hydrostatic pressures.

    c. Utility loads.

    d. Equipment.

    e. Traffic.

    f. Construction loads including impact.

    g. Other surcharge loads.

2. Design the excavation support system and all components:

    a. In such manner as will allow the safe and expeditious construction of the permanent structures.

    b. To minimize ground movement or settlement.

    c. To prevent damage to or movement of adjacent buildings, structures, roadways and utilities.

3. Design support members to resist the maximum loads expected to occur during the excavation and support removal stages.

4. Designs for staged removal shall conform to construction concrete placement and backfill sequence.

5. Design shall consider provisions for future construction, and limits on bracing level elevations as shown on the Drawings.

6. Maximum vertical center-to-center spacing of supports shall be 16 feet between the top two support levels and 12 feet below second support level unless otherwise approved.

    a. If decking beams are not required, install the uppermost bracing tier at a vertical distance of not more than six feet below the top of excavation.

7. Where water flows from the face of excavation, the maximum height of unsupported excavation shall not exceed 15 inches.

8. In running sand and silt, provide positive means for securing timber lagging to the soldier piles to avoid shifting or falling off of the lagging, and positive means for containing such material behind lagging.

9. No portion of the excavation support system's vertical face will be permitted to penetrate the design lines as indicated on the Drawings for the permanent concrete structure to be constructed within the excavation.

10. Vertical support capacity shall be provided for:

    a. Wall systems and internal bracing elements.

    b. Loads due to vertical force components of tieback anchors.

    c. The weight of the structural systems themselves.

    d. Live load on any portion of the system.

11. Review of the Contractor’s Shop Drawings and methods of construction by the Agency does not relieve the Contractor of responsibility for the adequacy of the excavation support systems.

B. Steel Components:

1. Design and fabrication of steel components shall be as specified in ASTM A36 and ASTM A328.

C. Timber Support Systems and Members:

1. Basis for determination of minimum allowable working stress: IBC.

2. The minimum thickness of timber lagging between soldier piles spaced five to seven feet center-to-center shall be three inches for excavations up to 25 feet in depth, and four inches for excavations deeper than 25 feet.

3. For other conditions and types of lagging, design calculations shall be submitted.

PART 2 - PRODUCTS

2.01 STEEL SHEET PILING

A. Steel sheet piling shall be continuous interlocking type.

1. The appropriate shape per ASTM A328.

2. Provided with at least one 2-1/2-inch diameter handling hole on the centerline of the web located at least 6 inches from each end of the sheet pile.

B. Fabricated connections and accessories, steel H-piles, WF shapes, and other structural steel shall conform to the requirements of ASTM A36, unless otherwise approved.

2.02 CONCRETE

A. Concrete shall be as specified below:

1. For encasement of steel soldier piles below the final level of excavation, a minimum of 2,500 psi shall be used.

2. For encasement of soldier piles above the final level of excavation, lean concrete shall be used, the strength of which shall be adequate to protect the excavated faces of the augured hole.

2.03 VERTICAL SHORES

A. Aluminum vertical shores shall consist of vertical plates and hydraulic cylinder jacks sized and spaced for the project conditions.

1. Vertical shores shall be as manufactured by Speed Shore or equal.

2.04 TRENCH SHIELD BOXES

A. Trench shield boxes shall be steel or aluminum and sized for the project conditions.

PART 3 - EXECUTION

3.01 GENERAL

A. The support system shall extend the main excavation bottom elevation to a depth adequate to prevent lateral movement and to adequately support applied vertical loads.

1. In areas where additional excavation is required below the main excavation subgrade provisions shall be made to prevent movement of main excavation supports.

2. Damage to existing utilities during installation of excavation support system shall be avoided.

3.02 SHEETING AND LAGGING

A. Sheeting and lagging shall be installed with no gap between the boards unless specifically approved.

1. As installation progresses, the voids between the excavation face and the lagging or sheeting shall be backfilled with sand or soil and rammed into place.

2. Materials such as hay or burlap shall be used where necessary to allow drainage of groundwater without loss of soil or packing material.

3. If gaps in the lagging are allowed, the gap width between lagging boards shall be limited to 1/2 inch maximum.

4. If unstable material is encountered, suitable measures shall be taken to retain it in place or to otherwise prevent soil displacement.

5. Extend lagging down to final subgrade.

6. A sufficient quantity of material shall be on hand for sheeting, shoring, bracing, and other operations for protection of work and for use in case of accident or emergency.

3.03 STEEL SHEET PILING

A. Steel sheet piling may be used only where existing subsurface conditions are suitable for installation of sheet piling to the full depth of penetration required, and to proper alignment and plumbness, specified herein, without damage to the sheet piling or rupture of its interlocks.

1. The use of steel sheet piling will not be permitted where sheeting would be required to penetrate boulders, rock or other materials which may prevent the proper installation of sheet piling.

B. Steel sheet piling shall be installed in plumb position with each pile interlocked with adjoining piles for its entire length so as to form a continuous diaphragm throughout the length of each run of wall, bearing tightly against original ground.

1. Install sheeting to depth required for design.

2. Exercise care during installation so that interlocking members can be extracted, if required, without injury to adjacent ground.

3. The installation equipment shall be suitable to the type and nature of the subsurface materials anticipated to be encountered.

4. The equipment and methods of installation, cutting, and splicing shall conform to the approved Shop Drawings.

C. Liner plate shall be installed to proper line and grade and dimensions which will enable final liner to be placed in accordance with tolerances specified by the Agency.

1. Annular voids, if present, shall be filled with tunnel grout as specified by the Agency.

3.04 INTERNAL BRACING SUPPORT SYSTEM

A. All bracing support members shall be installed and maintained in tight contact with each other and with the surface being supported.

B. Bracing members shall be preloaded by jacking the struts and shores in accordance with loads, methods, procedures, and sequence as described on the approved Shop Drawings.

1. Coordinate excavation work with bracing installation and preloading.

2. Use steel shims and steel wedges welded or bolted in place to maintain the preloading force in the bracing after release of the jacking equipment pressure.

3. Use procedures so as to produce uniform bracing member loading without appreciable eccentricities, overstressing, or support member distortion.

C. Struts shall be provided with intermediate bracing as needed to enable them to carry their maximum design load without distortion or buckling.

1. Provide diagonal bracing as necessary to maintain the stability of the system.

2. Web stiffeners, plates, or angles shall be provided as needed to prevent rotation, crippling, or buckling of connectors at points of bearing between structural steel members.

3. Allow for eccentricities resulting from field fabrication and assembly.

D. Excavations shall be to a depth no more than two feet below the elevation of the support member about to be placed.

1. The support member shall be installed and preloaded immediately after installation and prior to continuing excavation.

3.05 VERTICAL SHORES AND TRENCH SHIELD BOXES

A. All personnel involved in the installation, removal and use of vertical shores and trench boxes shall be trained in their use and advised of appropriate safety procedures.

B. Selection and installation of vertical shores and trench boxes shall be in accordance with the shoring product manufacturer's recommendations.

3.06 ENCOUNTERING ROCK

A. The Contractor's bid is based on sheeting and shoring in soils and rippable materials. If rock is encountered, the Contractor and the Agency shall negotiate methods and costs for the rock excavation.

B. Rock is a hard, natural substance which cannot be removed by a one cubic yard excavator bucket and requires the use of special impact tools specifically designed for cutting or breaking rock.

3.07 REMOVAL OF SUPPORT SYSTEMS

A. Where removal is required wholly or in part, such removal shall be performed in a manner that will not disturb or damage adjacent new or existing construction or utilities.

1. Fill all voids immediately with lean concrete, or other approved means.

B. All elements of support systems shall be removed to a minimum depth of six feet below final ground surface.

1. However, when a structure poured against the sheeting system extends above the 6-foot limit, removal of the sheeting system shall be to the top of the structure.

C. All damage to property resulting from removal shall be promptly repaired at no cost to the Agency.

1. The Agency shall be the sole judge as to the extent and determination of the materials and methods for repair.

END OF SECTION

SECTION 02200

SITE PREPARATION, EXCAVATION AND EARTHWORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Materials, testing, and installation of earthwork for excavations, fills or embankments for structures, roadways and sites.

1.02 RELATED REQUIREMENTS

A. Section 01300, Submittal Procedures

B. Section 01730, Record Drawings

C. Section 02010, Geotechnical Investigation

D. Section 02050, Demolition

E. Section 02223, Trenching, Backfilling and Compaction

F. Section 02160, Sheeting, Shoring and Bracing

G. Section 02500, Asphalt Paving

H. Section 03300, Cast-in-Place Concrete

1.03 REFERENCES

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

ASTM C150	Portland Cement
ASTM D75	Practice for Sampling Aggregates
ASTM D1556	Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Test Method for Moisture-Density Relations of Soils Using a Modified Effort
ASTM D2419	Test Method for Sand Equivalent Values of Soil and Fine Aggregate
ASTM D4253	Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Plate
ASTM D4254	Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density
ASTM D4718	Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles
ASTM D6938	Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

California Labor Code – Sections 6705 and 6707

California Code of Regulations Title 8, Construction Safety Orders, Article 6, Excavations, Trenches, Earthwork
California Code of Regulations Title 8, California Occupational Safety and Health Regulations (Cal/OSHA)
State of California, Department of Transportation, Standard Specifications

1.04 SUBMITTALS

A. All submittals shall be submitted in accordance with Section 01300, “Submittal Procedures”.

B. Submit a report from a Caltrans Authorized Testing Laboratory verifying that imported material conforms to the gradation specified.

1.05 QUALITY ASSURANCE

A. The Agency will test for compaction and relative density as described below.

1. Compaction tests will be performed for each lift or layer of earthwork as determined by the Agency.
2. Testing the density of soil in place.
    a. By the sand cone method per ASTM D1556.
        (1) The minimum depth for the sand cone test hole shall be 12 inches.
        (2) The minimum size shall be 8 inches.
        (3) Silica sand, size 16/30 or 10/20, shall be used.
    b. By nuclear methods per ASTM D6938.
3. If nuclear methods are used for in-place density determination:
    a. The compaction test results for maximum dry density and optimum water content shall be adjusted in accordance with ASTM D4718.
        (1) This is required for determination of percent relative compaction and moisture variation from optimum.
        (2) "Relative compaction" is the ratio, expressed as a percentage, of the in-place dry density to the laboratory maximum dry density.
4. Relative density of cohesionless soils to be tested per ASTM D4253 and ASTM D4254.
5. Sample materials per ASTM D75.
6. Laboratory moisture-density relations of soils to be tested per ASTM D1557.

B. Compaction shall be deemed to comply with the Technical Specifications when:

1. No test out of any three consecutive tests falls below the specified relative compaction and moisture content.
2. Recompaction of work not conforming to the Technical Specifications shall be done by the Contractor at no cost to the Agency.
    a. The cost of retesting work not conforming to the Technical Specifications shall be paid by the Contractor.

1.06 EXPLOSIVES

A. Use of explosives will not be permitted, unless specifically authorized, in writing, by the Agency.

PART 2 - PRODUCTS

2.01 STRUTURAL BACKFILL

A. Material to be placed adjacent to and around structures.

B. Material shall meet the requirements of the geotechnical report.

C. Excavated onsite material may be used for structural backfill provided it conforms to the above specifications for structural backfill material.

2.02 SELECT FILL

A. Material to be placed in locations that are not to be constructed as structural backfill.

1. Select fill material shall be native material unless other materials are required by the Technical Specifications or Drawings or as directed by the Agency.

    a. Excavated soils classified as silts and clays shall not be used in select fill.

    b. Oversize material defined as rock, or other irreducible material with a maximum dimension greater than or equal to 3 inches shall not be buried or placed in fill.

    c. Refer to Section 02223, “Trenching, Backfilling and Compaction” for requirements.

2.03 AGGREGATE BASE FOR HYDRAULIC STRUCTURES OR ROADWAYS

A. Aggregate base shall be Class II Base Rock per Caltrans Standard Specifications Section 26.

1. Maximum aggregate size is ¾ inch.

2.04 PERVIOUS BACKFILL MATERIAL

A. Conforming to Caltrans Standard Specifications Section 68-2.02F(3) for Class 2 Permeable Material.

2.05 SAND-CEMENT SLURRY BACKFILL

A. Sand-cement slurry used for backfill shall consist of one sack (94 pounds) of Portland cement per cubic yard of sand and sufficient moisture for workability.

2.06 WATER

A. Water for use in site preparation, excavation or earthwork shall be reasonably free of objectionable quantities of silt, oil, organic matter, alkali, salts and other impurities.

1. Water quality must be acceptable to the Agency.

PART 3 - EXECUTION

3.01 SITE PREPARATION

A. Areas to be excavated, filled, graded, and occupied by permanent construction or embankments shall be prepared by clearing and grubbing.

1. Refer to Section 02110, “Clearing and Grubbing” for requirements.

2. No trees, brush, or shrubs shall be removed unless designated for removal or required for Contractor access or execution of the work.

B. Existing paved areas that require pavement removal for Contractor access or execution of work shall be cleared and prepared for future paving.

1. Refer to Section 02500, “Asphalt Paving” for requirements.

C. Existing areas occupied by buildings or permanent constructions that require removal shall be cleared by demolition per the Technical Specifications and Drawings.

1. Refer to Section 02050, “Demolition” for requirements.

3.02 CONTROL OF WATER

A. The Contractor shall provide and operate equipment adequate to keep excavations and trenches free of water.

1. Furnish temporary drainage facilities to convey and dispose of surface water falling on or passing over the site.

3.03 EXCAVATION

A. Excavation is unclassified except rock excavation as defined in Paragraph 3.04.

1. Perform excavation regardless of the type, nature, or condition of the material encountered to accomplish the construction.

B. Do not operate excavation equipment within 5 feet of existing structures or newly completed structural construction.

1. Excavate with hand tools in these areas.

C. Excavations shall have sloping, sheeting, shoring, and bracing conforming to CAL/OSHA requirements.

1. Refer to Section 02160, “Sheeting, Shoring, and Bracing” for requirements.

D. After the required excavation for a building has been completed, the Agency will observe the exposed subgrade to determine the need for any additional excavation.

1. Additional excavation shall be conducted in all areas within the influence of the structure where unacceptable subgrade materials exist at the exposed subgrade at no additional cost to the Agency.

2. Overexcavation shall include the removal of all such unacceptable material.

   a. That exists directly beneath the structure.

   b. Or within a zone outside and below the structure defined by a line sloping at 1-horizontal to 1-vertical from 1 foot outside the edge of the footing.

3. Refill the overexcavated areas with structural backfill material.

4. The Contractor may use excavated material for his convenience at no cost to the Agency unless indicated otherwise by the Engineer or the Geotechnical Engineer.

3.04 ROCK EXCAVATION

A. Rock excavation is excavation of any hard, natural substance which cannot be removed by a one cubic yard excavator bucket and requires the use of special impact tools specifically designed for cutting or breaking rock.

B. The Contractor's bid is based on excavation in soils and rippable materials. If rock excavation is encountered, the Contractor and the Agency shall negotiate methods and costs for the rock excavation.

3.05 PREPARATION OF FOUNDATION SUBGRADE

A. Finished subgrade for foundations shall be within a tolerance of ±0.08 of a foot (1 inch) of the grade and cross section indicated on the Drawings.

1. It shall be smooth and free from irregularities.
2. It shall be at the relative compaction specified by the Technical Specifications or Drawings.
3. The subgrade shall extend over the full width and extend 1 foot beyond the edge of the foundations.

B. Remove soft material encountered and replace with structural backfill.

1. Fill holes and depressions to the required line, grade, and cross sections with structural backfill.

C. Compact the top 12 inches of the subgrade to 90% relative compaction at least 2% over the optimum moisture content unless otherwise shown in the Drawings.

1. Recompaction will not be required if rock is exposed at final subgrade.

D. If rock is encountered at final grade, overexcavate to a depth of 6 inches and place structural backfill to establish final grade.

3.06 PREPARATION FOR PLACING FILL OR BACKFILL

A. After excavation of existing material or removal of unacceptable material at the exposed subgrade, scarify the final subgrade surface to a depth of 12 inches and moisture condition and compact to the requirements of the geotechnical report unless otherwise shown in the Drawings or Technical Specifications.

B. Remove foreign materials and trash from the excavation before placing any fill material.

C. Attain the specified compressive strength and finish of concrete work before backfilling.

1. Refer to Section 03300, "Cast-in-Place Concrete" for requirements.

3.07 PLACING AND COMPACTING FILL

A. Place in maximum 8-inch loose lifts and moisture condition and compact each lift to the requirements of the geotechnical report unless otherwise shown in the Drawings or Technical Specifications.

B. Where fill is to be constructed on slopes steeper than 5:1, bench the fill into competent undisturbed materials as the fill progresses up the slope.

1. Benches shall be sloped at least 2% into the slope and shall be of a width at least equal to the height of fill lift unless otherwise indicated by the Engineer or the Geotechnical Engineer.

3.08 PLACING AND COMPACTING STRUCTURAL BACKFILL

A. Place structural backfill material around piping, structures, channels, and other areas, including authorized overexcavation areas, to the lines and grades shown or specified.

1. Do not exceed loose lifts of 8 inches.

B. Limits of Structural Backfill: Limits of structural backfill shall be 1.0 feet from edge of footing and shall extend at a 1:1 slope to the finish grade.

C. ompact each lift to the requirements of the geotechnical report, unless otherwise shown in the Drawings or Technical Specifications.

1. Stop structural backfill at least 6 inches below finished grade in all areas where topsoil is to be placed.

D. Do not operate earthmoving equipment within 5 feet of walls of concrete structures.

1. Place and compact backfill adjacent to concrete walls with hand-operated tampers or other equipment that will not damage the structure.

E. Backfill adjacent to water-holding basins and channels only after specified leakage tests have been conducted.

1. Refer to Section 02667, “Testing of Hydraulic Structures” for requirements.

3.09 MOISTURE CONTROL

A. During compacting operations, maintain optimum practicable moisture content required for compaction purposes in each lift of the material.

1. Maintain uniform moisture content throughout the lift.
2. Insofar as practicable, add water to the material at the site of excavation.
3. At the time of compaction, the water content of the material shall be near optimum water content for granular soils and aggregate base or at least 2 percentage points above optimum for clayey soils.
4. Aerate material containing excessive moisture by blading, disking, or harrowing to hasten the drying process.

3.10 SITE GRADING

A. Restore the finish grade to the original contours and to the original drainage patterns, except where shown otherwise on the Drawings.

1. Remove exposed roots exceeding 1 inch in diameter and loose rocks exceeding 3 inches in diameter.
2. Round tops of banks to circular curves of not less than a 6-foot radius.

3. Neatly and smoothly trim rounded surfaces.

4. Grade surfaces to drain away from structures.

5. Do not overexcavate and backfill to achieve the proper grade.

3.11 PLACING AND COMPACTING AGGREGATE BASE FOR HYDRAULIC STRUCTURES

A. Place the aggregate base in 6- to 8-inch loose lifts and compact to 90% relative compaction unless otherwise required by the geotechnical report or shown in the Drawings or Technical Specifications.

3.12 DISPOSAL OF EXCESS MATERIAL

A. Excess site excavated or wasted material shall be disposed of offsite by the Contractor at no additional cost to the Agency.

1. No prearranged disposal site or related permits have been determined or secured by the Agency.

END OF SECTION

SECTION 02223

TRENCHING, BACKFILLING AND COMPACTING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Trenching, backfilling and compacting requirements that apply to all piping.

1.02 RELATED REQUIREMENTS

A. Section 01300, Submittal Procedures

B. Section 01730, Record Drawings

C. Section 02010, Geotechnical Investigation

D. Section 02050, Demolition

E. Section 02350, Sheeting, Shoring and Bracing

F. Section 02200, Site Preparation, Excavation and Earthwork.

1.03 REFERENCES

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

ASTM C131	Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C150	Portland Cement
ASTM D75	Practice for Sampling Aggregates
ASTM D1556	Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Test Method for Moisture-Density Relations of Soils Using a Modified Effort
ASTM D2419	Test Method for Sand Equivalent Values of Soil and Fine Aggregate
ASTM D3776	Test Method for Mass Per Unit Area (Weight) of Woven Fabric
ASTM D4253	Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Plate
ASTM D4254	Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density
ASTM D4632	Test Method for Grab Breaking Load and Elongation of Geotextiles
ASTM D4751	Test Method for Determining the Apparent Opening Size of a Geotextile

California Labor Code – Sections 6705 and 6707

California Code of Regulations Title 8, Construction Safety Orders, Article 6, Excavations, Trenches, Earthwork.

California Code of Regulations Title 8, California Occupational Safety and Health Regulations (Cal/OSHA).

1.04 SUBMITTALS

A. All submittals shall be submitted in accordance with Section 01300.

B. Submit report from testing laboratory that imported material conforms to the specified gradations or characteristics.

C. Submit detailed plans and calculations for all trenching, sheet piling, shoring, bracing and underpinning where required, signed by a California licensed professional civil or structural engineer, prior to the initiation of such activities.

D. Submit permits for excavations and trenches required by the California Code of Regulations Title 8, Section 1539 prior to construction.

E. Obtain the necessary permits for all dewatering activities in accordance with the requirements of the applicable governmental agencies and submit these permits to the Agency prior to construction.

1.05 DEFINITIONS

A. Pipe Zone: The pipe zone includes the full width of the trench from 6 inches below the bottom of the pipe to 12 inches above the top of the pipe and extends into manhole or vault excavations to the point of contact with the structure.

B. Trench Zone: The trench zone includes the portion of the trench from the top of the pipe zone to the bottom of the pavement zone in paved areas, or to the existing surface in unpaved areas, and extends into manhole or vault excavations above the pipe zone.

C. Pavement Zone: The pavement zone includes the concrete or asphalt concrete pavement and aggregate base section placed over the trench zone and extends into manhole or vault excavations above the trench zone.

D. Rock Excavation: Rock excavation is excavation of any hard, natural substance which cannot be removed by a one cubic yard excavator bucket and requires the use of special impact tools specifically designed for cutting or breaking rock.

PART 2 - PRODUCTS

2.01 PIPE ZONE

A. Free-draining clean sand shall be used as bedding. Clean sand is defined as 100 percent passing the #4 sieve, and less than 5 percent passing the #200 sieve. For pipes located underneath the ponds or for pipes crossing between the ponds or across the levee cross section (i.e., perpendicular to the access roads located atop the levees), the pipe zone should be backfilled with sand-cement slurry meeting the requirements specified below.

B. Imported sand shall have a minimum sand equivalent of 30 per ASTM D2419, with 100% passing a 3/8” sieve and not more than 5% passing a 200-mesh sieve.

C. Use sand-cement slurry within the Pipe Zone only where specifically called for in the Drawings or these Technical Specifications or with prior approval from the Agency.

1. Sand-cement slurry shall consist of one sack (94 pounds) of Portland cement per cubic yard of sand and sufficient moisture for workability.

D. Filter fabric shall be a non-woven geotextile (polyester, nylon or polypropylene) and meet the following requirements:

1. Grab tensile strength (ASTM D4632): 100 lbs. minimum for a 1-inch raveled strip.
2. Weight (ASTM D3776): 4.0 oz./sq. yd.
3. Apparent opening size (ASTM D4751): 0.0083 inch.
4. The filter fabric shall be MIRAFI 140N or approved equal.

2.02 TRENCH ZONE

A. Backfill

1. On-site inorganic soil, or approved import material meeting the geotechnical report requirements shall be used as trench zone backfill.
2. Rocks, broken concrete, asphalt pavement and other solid materials shall not be placed in the trench zone backfill.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. The Contractor shall be responsible for the care and protection of all existing utilities, facilities and structures that may be encountered in or near the area of the work.

B. The Contractor shall be responsible for the protection of all trees, shrubs, fences, and other landscape items adjacent to or within the work area.

C. The Contractor shall provide continuous, unobstructed access to all driveways, properties, water valves, hydrants and other facilities within or adjacent to the work

D. Sawcut bituminous and concrete pavements, curbs and sidewalks prior to excavation of the trenches.

3.02 EXISTING UTILITIES

A. Existing utilities are shown from available records. The accuracy of their location cannot be guaranteed.

1. The Contractor shall pothole as necessary to locate horizontally and vertically all existing utilities. Any discrepancy from the Drawings shall be reported to the Agency immediately.
2. The Contractor shall be responsible for all costs due to discrepancies in the location of existing utilities if the Contractor fails to pothole and locate existing utilities and notify the Agency of the discrepancies prior to start of construction.
3. Abandoned utilities encountered during all construction operations shall be removed as required to complete all work shown on plans.
4. Live utilities shall remain in service at all times unless otherwise noted.
    a. If utilities must be removed to complete works, the Contractor shall install by-pass or temporary utilities prior to taking the utilities out of service.

3.03 TRENCH OPENING

A. Trench widths in the pipe zone:

1. Maximum width shall be 24 inches greater than the pipe outside diameter not including the bells.

2. Minimum width shall be 12 inches greater than the pipe outside diameter not including the bells.

B. Trench width at the top of the trench is not limited except where width of excavation would undercut adjacent structures or footings. In such cases, the width of trench shall be such that there is at least 18 inches between the top edge of the trench and the structure or footing.

C. The maximum length of open trench at one location shall be the length necessary to accommodate the amount of pipe installed in a single day, but shall not exceed 400 linear feet.

1. All trenches shall be fully backfilled at the end of each day.

2. Barricades and warning lights meeting CAL/OSHA requirements for open trenches shall be provided and maintained.

3.04 SHEETING, SHORING AND BRACING OF TRENCHES

A. Excavations shall be shored, sheeted, and supported such that the walls of the excavation will not slide or settle and all existing improvements of any kind, either on public or private property, will be fully protected from damage.

B. Refer to Section 02160, “Sheeting, Shoring, and Bracing” for the sheeting, shoring and bracing of trenches requirements.

C. Refer to Section 02200, “Site Preparation, Excavation and Earthwork” for requirements.

D. The Contractor shall furnish safe and acceptable working conditions in accordance with the California Division of Industrial Safety Construction Safety orders.

E. The Contractor shall ensure that a competent person, provided by the Contractor, is on site during all trenching operations to supervise the sheeting, shoring and bracing of trenches.

F. Contractor shall prepare, obtain, and pay for all required State, Local, and/or Regional permits as required by the governing agency, regulators, and/or the law for all excavation and trenching in excess of 5 foot depth.

G. For all activities beyond the scope of the California Division of Industrial Safety Construction Safety Orders, the Contractor shall submit to the Agency detailed plans and calculations for all trenching, sheet piling, shoring, bracing and underpinning signed by a California licensed professional civil or structural engineer prior to the initiation of such activities.

H. When the situation arises, sheeting and bracing shall be used as necessary to protect the integrity of affected structures.

I. All costs associated with trenching, sheet piling, shoring, bracing and underpinning shall be included with the Contractor's bid. No additional payment above the Contract Price will be made for trench sheeting left in place.

3.05 LOCATION OF EXCAVATED MATERIAL

A. During trench excavation, place the excavated material as indicated in the drawings.

1. If no information is provided, place excavated material adjacent to the trench, or as directed by the Agency.
2. Do not obstruct any roadways or streets.
3. Conform to federal and state codes governing the safe loading of excavated material adjacent to trenches.

3.06 DEWATERING

A. Utilities shall be laid "in the dry", unless otherwise approved in writing by the Agency.

1. Refer to Section 02140, “Dewatering” for dewatering requirements.
2. The Contractor, at no direct cost to the Agency, shall perform all dewatering activities.

3.07 GRADE

A. Excavate the trench to the lines and grades shown on the Drawings with allowance for pipe thickness and for pipe bedding.

1. If the trench is excavated below the required grade, refill the part of the trench excavated below the grade at no additional cost to the Agency with free-draining clean sand bedding material unless sand-cement slurry is required by the Drawings, Specifications, the Engineer, or the Geotechnical Engineer.
    a. Place the refilling material over the full width of trench in compacted layers to restore the established grade. Apply the free-draining clean sand bedding material in layers not greater than 8 inches thick, moisture conditioned and compacted per the geotechnical report requirements unless sand-cement slurry is required by the Drawings, Specifications, the Engineer, or the Geotechnical Engineer.
    b. Over excavations, not authorized by the Agency, are the Contractor's responsibility with no additional compensation due the Contractor.
2. If the trench is over excavated for the removal of entire large rocks, refill the part of the trench excavated below the grade at no additional cost to the Agency with free draining clean sand bedding material moisture conditioned and compacted per the geotechnical report unless sand-cement slurry is required by the Drawings, Specifications, the Engineer, or the Geotechnical Engineer.

3.08 MATERIAL REPLACEMENT

A. Remove and replace any trenching and backfilling material which does not meet the specifications at the Contractor's expense.

3.09 COMPACTION REQUIREMENTS

A. Pipe Zone: Pipe zone material shall be compacted per the geotechnical report requirements.

B. Trench Zone: Trench Zone material shall be compacted per the geotechnical report requirements.

C. Trench backfill shall be conditioned with water to produce a soil water content of near optimum moisture content for granular soils and at least 2% above the optimum moisture content and placed in horizontal layers not exceeding 8 inches in thickness before compaction.

1. Compact material by using mechanical compaction or hand tamping. Do not use high impact hammer-type equipment except where the pipe manufacturer warrants in writing that such use will not damage the pipe.

2. Do not use any axle-driven or tractor-drawn compaction equipment within 5 feet of walls or structures.

D. Testing requirements:

1. Density tests for determination of the specified densities shall be made every 300 feet of trench length, or as determined appropriate by the Soils Technician.

2. The Soils Technician will test the trench backfilling for relative compaction.

a. At least one test will be performed for every 300 feet of trench and each 2 feet of fill depth.

b. If any test results are unsatisfactory, the Contractor shall re-excavate, recompact the backfill, and retest, at his expense until the desired compaction is obtained.

c. Additional compaction tests shall be made to each side of an unsatisfactory test, as directed by the Agency, to determine the extent of re-excavation and recompaction necessary.

E. Jetted backfill: Water densification of backfill shall not be allowed under any conditions.

3.10 FOUNDATION STABILIZATION

A. Whenever the trench bottom does not afford a sufficiently solid and stable base to support the pipe or appurtenances, the Contractor shall:

1. Excavate to a depth below the design trench bottom, as recommended by the Geotechnical Engineer and directed by the Agency

2. Backfill the trench bottom with rock refill material unless sand-cement slurry is required by the Drawings, Specifications, the Engineer, or the Geotechnical Engineer.

3. Where foundation stabilization is required, the Contractor and the Agency shall negotiate costs for the over excavation and rock refill.

3.11 FILTER FABRIC

A. In wet, soft or spongy ground conditions use filter fabric to enclose the entire pipe zone in filter fabric. On the top of the pipe zone overlap the filter fabric equal to the trench width unless sand-cement slurry is required by the Drawings, Specifications, the Engineer, or the Geotechnical Engineer.

B. Wet ground conditions include standing, seeping or flowing water.

C. Wet ground conditions include areas of suspected periodic high groundwater.

3.12 TRENCH BACKFILLING

A. Backfill the pipe zone:

1. Place the specified thickness of pipe bedding over the full width of trench. Grade the top of the pipe bedding before pipe laying to provide firm, uniform support along the full length of pipe.
2. Excavate bell holes at each joint to permit proper assembly and inspection of the joint.
3. Carefully place the pipe zone material around the pipe so that the pipe barrel is completely supported and that no voids or uncompacted areas are left beneath the pipe.
4. Place pipe zone material simultaneously on both sides of the pipe, keeping the level of backfill the same on each side to prevent lateral movement of the pipe.
5. Compact pipe zone material placed within 12 inches of the outer surface of the pipe by mechanical means.

B. Backfill the trench zone:

1. Push the backfill material carefully into the trench.
2. Compact backfill in no more than 8-inch thick horizontal layers.
3. Do not permit free fall of the material until at least 2 feet of cover is provided over the top of the pipe.
4. Do not drop sharp, heavy pieces of material directly onto the pipe or the tamped material around the pipe.

3.13 SETTLEMENT

A. Contractor shall be responsible for all settlement of trench backfill which may occur within the warranty period stipulated in the General Conditions.

B. Contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after notice from Agency.

END OF SECTION

SECTION 02270

TEMPORARY SOIL EROSION AND SEDIMENT CONTROL

PART 1 – GENERAL

1.01 WORK OF THIS SECTION

A. In compliance with the local, State and Federal regulations regarding storm water management during construction, the Contractor shall not allow any debris, waste materials or pollutants, originating from the Contractor's operations, to enter the storm drainage system. The Contractor shall be fully responsible for developing and implementing a Storm Water Pollution Prevention Plan (SWPPP).

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. The Work of the following Sections applies to the Work of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this Work.

Section 01900 – Permits and Other Regulatory Requirements.

Section 01300 – Submittal Procedures.

Section 02140 – Dewatering.

1.03 STORM WATER POLLUTION PREVENTION MEASURES

A. The Contractor shall conform to all applicable local, state and Federal regulations and laws pertaining to water pollution control. The Contractor shall conduct and schedule its operations, and follow and implement Best Management Practices (BMP) in such a manner as to prevent water pollution. The Contractor shall also conform to the following requirements:

1. Sediments shall not be discharged to a storm drain system or receiving waters.
2. Sediments generated on the work site shall be contained on the work site using appropriates BMP's.
3. No construction related materials, waste, spill, or residue shall be discharged from the work site to streets, drainage facilities, receiving waters, or adjacent property by wind or runoff.
4. Non-storm water runoff from equipment, vehicle washing, or any other activity shall be contained within the work site using appropriate BMP's.
5. Erosion shall be prevented. Erosion susceptible slopes shall be covered, planted or otherwise protected in a way that prevents discharge from the work site.

B. The CONTRACTOR shall contain and remove any and all waste or pollutants generated by the CONTRACTOR's construction operations using the appropriate Best Management Practices (BMPs) by preparing a SWPPP. The SWPPP shall be submitted for approval to the AGENCY and the appropriate regulatory agencies in accordance with Section 01900. The SWPPP shall be written, amended, and certified by a Qualified SWPPP Developer (QSD) in accordance with the General Permit.

C. The CONTRACTOR shall be responsible throughout the duration of the construction period for installing and maintaining the applicable BMPs and for removing and legally disposing of temporary control measures, wastes and pollutants at an off-site location. The CONTRACTOR shall ensure all BMPs and temporary control measures required by the General Permit and the SWPPP are implemented by a Qualified SWPPP Practitioner (QSP) in accordance with the General Permit. Unless otherwise directed by the AGENCY or specified elsewhere in these specifications, the CONTRACTOR's responsibility for BMP implementation shall continue throughout any temporary suspension of work.

D. The CONTRACTOR is responsible for all treatment necessary to ensure water is disposed of in a legal manner.

E. In accordance with the General Permit and the SWPPP, the CONTRACTOR shall develop a Rain Event Action Plan (REAP) within 48 hours prior to any likely precipitation event.

1.04 RESPONSIBILITIES, CONSEQUENCES, AND REMEDIES

A. Conformance with the provisions of this section shall not relieve the CONTRACTOR from the CONTRACTOR's responsibilities of the Contract Documents.

B. For purposes of this section, costs and liabilities include, but are not limited to, fines, penalties and damages, whether assessed against the AGENCY or the CONTRACTOR, including those levied under the Federal Clean Water Act and the State Porter-Cologne Water Act.

C. If solid or liquid materials or waste, hazardous or otherwise, or pollutants originating from the CONTRACTOR's operation enter the storm drain system or water courses, the CONTRACTOR will be required to thoroughly clean up the affected storm drain facilities and water courses to the satisfaction of the AGENCY. If the CONTRACTOR fails to clean up the affected facilities as required, the AGENCY will issue a stop-work order and take necessary actions to ensure the cleanup of the affected facilities.

D. The CONTRACTOR shall be responsible for all costs, including fines, the AGENCY's cost of defense, the cost of cleanup by others ordered by the AGENCY, and liabilities imposed by law as a result of the CONTRACTOR's failure or negligence in complying with the requirements specified herein.

PART 2 - MATERIALS (NOT USED)

PART 3 - EXECUTION

3.01 SWPPP PREPARATION AND IMPLEMENTATION

A. The CONTRACTOR, as a registered QSD/QSP or under the direction of a registered QSD/QSP, shall develop and implement a project specific SWPPP based on the CONTRACTOR's construction activities to ensure compliance with the State Water Resources Control Board (SWRCB) General Permit for Storm Water Discharges Associated with Construction Activity in accordance with Section 01900. The SWPPP shall be kept on file with any amendments and made available upon request of the AGENCY or representative from the Regional Water Quality Control Board or the SWRCB.

B. Amendments or changes to the SWPPP shall be performed by the CONTRACTOR and QSD, and are a requirement of the Contract Documents. The cost for implementing and maintaining the General Permit conditions and SWPPP and BMP requirements shall be included in the cost of the construction; no additional compensations shall be given to meet or amend the SWPPP.

3.02 SELECTIVE BMPS FOR STORM WATER POLLUTION PREVENTION

A. The CONTRACTOR shall conform to all applicable local, state and Federal regulations and laws pertaining to water pollution control. The CONTRACTOR shall conduct and schedule its operations, and follow and implement Best Management Practices (BMP) in such a manner as to prevent water pollution. The Contractor shall also conform to the following requirements:

1. Sediments shall not be discharged to a storm drain system or receiving waters.
2. Sediments generated on the work site shall be contained on the work site using appropriates BMP's.
3. No construction related materials, waste, spill, or residue shall be discharged from the work site to streets, drainage facilities, receiving waters, or adjacent property by wind or runoff.
4. Non-storm water runoff from equipment, vehicle washing, or any other activity shall be contained within the work site using appropriate BMP's.
5. Erosion shall be prevented. Erosion susceptible slopes shall be covered, planted or otherwise protected in a way that prevents discharge from the work site.

3.03 CONTRACTOR TRAINING AND AWARENESS

A. The CONTRACTOR shall train all employees and subContractors on the storm water pollution prevention requirements contained in these specifications.

B. The CONTRACTOR shall inform subContractor of the storm water pollution prevention contract requirements and include appropriate subcontract provisions to ensure that these requirements are met.

C. The CONTRACTOR shall post warning signs in areas treated with chemicals.

3.04 BMP MAINTENANCE

A. To ensure proper implementation and effectiveness of the BMPs, the CONTRACTOR shall regularly inspect, maintain, repair and/or replace the deployed BMPs throughout the construction site. The CONTRACTOR shall identify corrective actions and the time needed to address any deficient BMPs or reinitiate any BMPs that have been discontinued. The CONTRACTOR shall keep written records of all BMP inspections, maintenance and corrective actions.

B. The frequency of the BMP inspection shall be as follows:

1. Prior to a forecast storm
2. After any precipitation that causes runoff
3. At 24-hour intervals during extended rain events
4. Routinely, at a minimum of once every week

C. If the CONTRACTOR or the AGENCY identifies a deficiency in the deployment or functioning of a BMP, the deficiency shall be corrected immediately. If requested by the CONTRACTOR and approved by the AGENCY in writing, the deficiency may be corrected at a later time or date but the corrective action shall not be later than the onset of the subsequent rain event. The correction of deficient BMPs shall be at no additional cost to the AGENCY.

3.05 EROSION CONTROL

A. During all phases of construction, the CONTRACTOR shall perform the work in a manner which will minimize soil erosion and prevent water pollution from site runoff by utilizing the following:

1. Proper scheduling of work and careful construction practices.
2. Grading disturbed surfaces to provide positive drainage and prevent ponding of water.
3. Installing desilting basins, gravel bag dikes, silt fences and other erosion control measures to prevent sediment escape from the construction site and to maintain runoff quality.

END OF SECTION

SECTION 02510

ASPHALT CONCRETE PAVEMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Hot-mix asphalt patching.

B. Hot-mix asphalt paving.

C. Hot-mix asphalt overlay.

D. Asphalt surface treatments.

1.02 RELATED REQUIREMENTS

A. Division 01 Specification Sections.

B. Section 01300, Submittal Procedures.

C. Section 02010, Geotechnical Investigation

D. Section 02050, Demolition.

E. Section 02200 Site Preparation, Excavation and Earthwork.

1.03 REFERENCES

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics Using Modified Effort

ASTM D3910 - Standard Practices for Design, Testing, and Construction of Slurry Seal

AASHTO M140 - Emulsified Asphalt Analysis

California DOT PTWB-01 - Paint, Rapid Dry Waterborne Traffic Line, White, Yellow and Black

State of California Department of Transportation (Caltrans) Standard Specifications, Latest Edition

1.04 SUBMITTALS

A. All submittals shall be submitted in accordance with Section 01300, “Submittal Procedures”.

B. Submit the following information:

1. Test Report for Asphalt Cement:

a. Submit minimum 10 days prior to start of production.

b. Show appropriate test method(s) for each material and the test results.

2. Manufacturer's Certificate of Compliance, for the following materials:

a. Aggregate: Gradation, source test results as defined in this section.

b. Asphalt for Binder: Type, grade, and viscosity-temperature curve.

c. Prime Coat: Type and grade of asphalt.

d. Tack Coat: Type and grade of asphalt.

e. Additives.

f. Mix: Conforms to job-mix formula.

3. Statement of qualification for independent testing laboratory.

4. Test Results:

a. Mix design.

b. Asphalt concrete core.

c. Gradation and asphalt content of uncompacted mix.

d. Field density.

1.05 DESCRIPTION

A. The Contractor shall construct paving as detailed on the Drawings. In all cases, surfaces shall be formed and adequately sloped to assure the prevention of ponding.

B. All street pavement and surfaces, and driveways, which are removed or damaged due to the Contractor's installation of improvements under this contract shall be replaced and/or reconstructed by the Contractor as specified herein, and approved by the Owner.

C. The Contractor shall acquire all, pay all related fees from, and conform to the requirements of any permits which the local agencies, the County, and any local jurisdiction requires relative to excavation and paving within streets.

D. Where new asphalt concrete (AC) pavement is used, the required sections are shown on the plans.

1.06 FIELD CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

1. Prime Coat: Minimum surface temperature of 60 deg F (15.6 deg C).

2. Tack Coat: Minimum surface temperature of 60 deg F (15.6 deg C).

3. Slurry Coat: Comply with weather limitations in ASTM D 3910.

4. Asphalt Base Course: Minimum surface temperature of 40 deg F (4.4 deg C) and rising at time of placement.

5. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.6 deg C) at time of placement.

PART 2 - MATERIALS

2.01 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: ASTM D 692/D 692M, sound; angular crushed stone, crushed gravel.

C. Fine Aggregate: ASTM D 1073 sharp-edged natural sand or sand prepared from stone, gravel, or combinations thereof.

1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

2.02 ASPHALT MATERIALS

A. Asphalt Binder: AASHTO M 320, PG 64-10.

B. Prime Coat: Liquid asphalt, Grade SC-250

C. Tack Coat: ASTM D 977 emulsified asphalt, or ASTM D 2397 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application

D. Slurry Seal: SS-1h asphalt emulsion.

E. Soil Sterilant: Polybor Chromate as manufactured by U.S. Borax or equal.

2.03 MIXES

A. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes approved by CALTRANS and County of Monterey and complying with the following requirements:

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.

2.04 PAVEMENT HEADERS

A. Redwood headers of 2-inch by 6-inch foundation grade redwood with 2-inch by 2-inch by 24-inch nominal redwood stakes set at 3 feet on center and within 6-inches of all angle points shall be provided at all locations where the vertical edges of the proposed asphalt pavement are not in contact with an existing pavement or permanent structures, including curbs and gutters.

B. Alternative Concrete Curb: In lieu of redwood headers, Contractor may provide 6-inch wide by 6-inch deep concrete header. Top of concrete header shall be flush with pavement or gravel access road. Concrete shall conform to requirements of Section 03310, “Cast-in-Place Sitework Concrete”.

PART 3 - EXECUTION

3.01 PAVEMENT REMOVAL

A. Initially cut asphalt concrete pavement with pneumatic pavement cutter or other equipment at the limits of the excavation and remove the pavement. After backfilling the excavation, saw cut asphalt concrete pavement to a minimum depth of 1-1/2 inches at a point not less than 12 inches

outside the limits of the excavation or the previous pavement cut, whichever is greater, and remove the additional pavement.

B. Saw cut concrete pavement, including cross gutters, curbs and gutters, sidewalks, and driveways to a minimum depth of 1-1/2 inches at a point 12 inches beyond the edge of the excavation and remove the pavement. The concrete pavement may initially be cut at the limits of the excavation by other methods prior to removal and the saw cut made after backfilling the excavation. If the saw cut falls within 3 feet of a concrete joint or pavement edge, remove the concrete to the joint or edge.

C. Saw cuts shall be straight along both sides of trench and provide clean, solid, vertical faces free from loose material. Saw cut and remove damaged or disturbed adjoining pavement.

D. Make arrangements for and dispose of the removed pavement.

3.02 EXAMINATION

A. Verify that subgrade is firm and stable and in suitable condition to begin paving.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Engineer or the Geotechnical Engineer, and replace with compacted backfill or fill as directed the Engineer or the Geotechnical Engineer.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.03 SUBGRADE PREPARATION

A. Scarify subgrade soils to a minimum depth of 12-inches, bring to at least 2 percent over optimum moisture content, and compact to a minimum of 92% relative compaction per ASTM D1557. Subgrade should be firm and stable prior to placement of aggregate base.

B. Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

C. Verify gradients and elevations of base are correct.

3.04 SOIL STERILANT

A. Spread uniformly upon prepared subgrade at the rate of 4-pounds of chemical per 100-square feet of area, subject to the manufacturer’s recommendations, for the full width of roadway or parking area to be paved or surfaced.

3.05 AGGREGATE BASE COURSE

A. Place and compact aggregate base course to 95% relative compaction.

3.06 PREPARATION

A. Primer

1. Apply primer in accordance with manufacturer's instructions.
2. Apply primer on aggregate base or subbase at uniform rate of 0.25 gal/sq yd.
3. Use clean sand to blot excess primer.

B. Tack Coat

1. Apply tack coat in accordance with manufacturer's instructions.

3.07 PLACING HOT-MIX ASPHALT

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
2. Spread mix at a minimum temperature of 250 deg F (121 deg C).
3. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
4. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches (25 to 38 mm) from strip to strip to ensure proper compaction of mix along longitudinal joints.
2. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.08 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Unless indicated otherwise by the Engineer, no less than 91 percent or greater than 97 percent of reference laboratory density according to ASTM D 2041.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.09 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch (13 mm).
2. Surface Course: Plus 1/4 inch (6 mm), no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch (6 mm)
2. Surface Course: 1/8 inch (3 mm)

3.10 SLURRY SEAL

A. Site Preparation

1. Street sweeper shall pass through all areas that will be covered by the slurry seal to enhance adhesion between asphalt.
2. Cover all manholes, valve and monument covers, grates, or other exposed facilities located within the area of application with plastic or other oil resistant construction paper secured by tape/adhesive.
3. Only place slurry seal if both the pavement and air temperatures are at least 50 degrees F and rising. If rain is expected within the 24 hours after placement do not prepare site or place slurry seal.
4. Remove concrete bumpers prior to slurry seal and keep in a staging area. Once the slurry seal has had adequate time to set, reinstall concrete bumpers.

B. Slurry Seal Mixing and Spreading

1. Truck mounted mixer spreaders must proportion asphaltic emulsion, water, and aggregate and mix them in continuous pugmill mixers.

2. Spread slurry seal uniformly within the equipment's specified spread rate range.

3. Longitudinal joints shall correspond with lane lines. Spread slurry seal in full lane widths. Do not overlap slurry seal between adjacent lanes more than 3 inches.

4. The mixture must be uniform and homogenous after spreading, and there must not be separation of the emulsion and aggregate after setting.

5. Protect the slurry seal from damage until it has cured per the manufacturer's specifications and it will not adhere or be picked up by vehicles tires.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979

1. Reference maximum theoretical density will be determined by averaging results from two samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.

2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.

a. Unless indicated otherwise by the Engineer, one core sample will be taken for every 1000 sq. yd. (836 sq. m) or less of installed pavement, with no fewer than three cores taken.

b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

E. Replace and compact hot-mix asphalt where core tests were taken.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.12 STRIPING

A. Traffic striping and curb and pavement markings shall conform to the dimensions and details as shown on the plans.

B. Site Preparation

1. Contractor shall ensure that the application surface is clean. If surface is not clean, surface shall be swept.

C. Application

1. Paint shall be mixed thoroughly prior to application by a mechanical mixer. This shall be done for a sufficient time to ensure the pigment and vehicle mix together.

2. Paint shall be applied via a paint striping machine to be approved by the engineer.

3.13 ADJUST VALVE BOX RINGS AND COVERS

A. Adjust all valve box rings and manhole covers to grade to agency standards within 30 days after final paving.

END OF SECTION

SECTION 03100

CONCRETE FORMWORK

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall provide concrete formwork, bracing, shoring, supports, and falsework, in accordance with the Contract Documents.

1.02 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Government Standards:

1. Product Standards Section - U.S. Department of Commerce (PS):

   1 Construction and Industrial Plywood

   20 American Softwood Lumber Standard

B. Commercial Standards:

1. American Concrete Institute (ACI):

   117 Standard Tolerances for Concrete Construction and Materials

   347R Guide to Formwork for Concrete

C. California Division of Industrial Safety, Construction Safety Orders.

1.03 SUBMITTALS

A. Falsework Calculations and Drawings: The Contractor's attention is directed to the provisions of Section 1717 of the Division of Industrial Safety, Construction Safety Orders, as revised November 1973, which requires that all falsework or vertical shoring installations where the height of the falsework or vertical shoring, as measured from the top of the sills to the soffit of the superstructure, exceeds 14 feet, or where individual horizontal span lengths exceed 16 feet, or provision for vehicular or railroad traffic through falsework or vertical shoring is made, shall be approved and signed by a Civil Engineer, registered in the State of California; provided further, that a copy of the falsework plan or shoring layout shall be available on the jobsite at all times.

B. In accordance with the requirements in Section 01300, Submittal Procedures, submit detailed Drawings of the falsework proposed to be used. Such Drawings shall be in sufficient detail to indicate the general layout, sizes of members, anticipated stresses, grade of materials to be used in the falsework, means of protecting existing construction which supports falsework, and typical soil conditions.

C. The Contractor shall, in accordance with the requirements in Section 01300, Submittal Procedures, submit the following:

1. Form ties and all related accessories, including taper tie plugs, if taper ties are used.

2. Form gaskets.

1.04 QUALITY ASSURANCE

A. Tolerances: The variation from established grade or lines shall not exceed 1/4 inch in 10 feet and there shall be no offsets or visible waviness in the finished surface. All other tolerances shall be within the tolerances of ACI 117.

PART 2 - MATERIALS

2.01 GENERAL

A. Except as otherwise accepted by the Engineer, all lumber brought on the jobsite for use as forms, shoring, or bracing shall be new material. All forms shall be smooth surface forms and shall be of the following materials:

1. Walls: Steel or plywood panel.
2. Columns: Steel, plywood or fiberglass.
3. Roof and Floor: Plywood.
4. All Other Work: Steel panels, plywood, or tongue and groove lumber.

B. Form materials which may remain or leave residues on or in the concrete shall be classified as acceptable for potable water use by the Environmental Protection Agency within 30 days of application or use.

2.02 FORM AND FALSEWORK MATERIALS

A. Materials for concrete forms, formwork, and falsework shall conform to the following requirements:

1. Lumber shall be Douglas Fir or Southern Yellow Pine, construction grade or better, in conformance with U.S. Product Standard PS 20.

B. Unless otherwise indicated, exterior corners in concrete members shall be provided with 3/4-inch chamfers. Re-entrant corners in concrete members shall not have fillets unless otherwise indicated.

C. Forms and falsework to support the roof and floor slabs shall be designed for the total dead load, plus a live load of 50 psf (minimum). The minimum design load for combined dead and live loads shall be 100 psf.

D. Provide forms conforming to ACI 347R.

E. Class I Forms: Use steel forms, ply form, or smooth surface plywood 3/4-inch minimum thickness for straight surfaces and 1/2-inch minimum thickness for curved surfaces.

F. Class II Forms: Use plywood in good condition, metal, or smooth planed boards free from large or loose knots with tongue and groove or ship lab joints. Forms shall be oiled.

G. Class II forms may be used for exterior concrete surfaces which are 1 foot or more below finished grade. Use Class I forms for all other surfaces.

2.03 FORM RELEASE AGENT

A. Only use form release agents which effectively prevent absorption of moisture and prevent bond with the concrete. Agent shall be non-staining and nontoxic after 30 days.

B. For steel forms, release agent shall prevent discoloration of the concrete due to rust.

2.04 FORM TIES

A. Form ties with integral waterstops shall be provided with a plastic cone or other suitable means for forming a conical hole to ensure that the form tie may be broken off back of the face of the concrete. The maximum diameter of removable cones for rod ties, or of other removable form tie fasteners having a circular cross section, shall not exceed 1 1/2 inches; and all such fasteners shall be such as to leave holes of regular shape for reaming. Form ties shall be Burke Penta Tie system by The Burke Company; Richmond Snap Tys by the Richmond Screw Anchor Company; or equal.

B. Form ties for water-retaining structures shall have integral waterstops. Removable taper ties may be used when approved by the Engineer. A preformed, neoprene or polyurethane tapered plug, sized to seat at the center of the wall shall be inserted in the hole left by the removal of the taper tie. Use Burke Taper Tie System by The Burke Company; Taper Ty by the Richmond Screw Anchor Company; or equal.

PART 3 - EXECUTION

3.01 GENERAL

A. Forms to confine the concrete and shape it to the required lines shall be used wherever necessary. The Contractor shall assume full responsibility for the adequate design of all forms, and any forms which are unsafe or inadequate in any respect shall promptly be removed from the work and replaced at no increased cost to the Authority. Provide worker protection from protruding reinforcement bars in accordance with applicable safety codes. A sufficient number of forms of each kind shall be provided to permit the required rate of progress to be maintained. The design and inspection of concrete forms, falsework, and shoring shall comply with applicable local, state and Federal regulations. Plumb and string lines shall be installed before concrete placement and shall be maintained during placement. Such lines shall be used by Contractor's personnel and by the Engineer and shall be in sufficient number and properly installed. During concrete placement, continually monitor plumb and string line form positions and immediately correct deficiencies.

B. Concrete forms shall conform to the shape, lines, and dimensions of members as called for on the Drawings, and shall be substantial, free from surface defects, and sufficiently tight to prevent leakage. Forms shall be properly braced or tied together to maintain their position and shape under a load of freshly placed concrete. If adequate foundation for shores cannot be secured, trussed supports shall be provided.

3.02 FORM DESIGN

A. All forms shall be true in every respect to the required shape and size, shall conform to the established alignment and grade, and shall be of sufficient strength and rigidity to maintain their position and shape under the loads and operations incident to placing and vibrating the concrete. Suitable and effective means shall be provided on all forms for holding adjacent edges and ends of panels and sections tightly together and in accurate alignment so as to prevent the formation of ridges, fins, offsets, or similar surface defects in the finished concrete. Plywood, 5/8 inch and greater in thickness, may be fastened directly to studding if the studs are spaced close enough to prevent visible deflection marks in the concrete. The forms shall be tight so as to prevent the loss of water, cement, and fines during placing and vibrating of the concrete. Specifically, the bottom of wall forms that rest on concrete footings or slabs shall be provided with a gasket to prevent loss of fines and paste during placement and vibration of concrete. Such gasket may be a 1 to 1 1/2-inch diameter polyethylene rod held in position to the underside of the wall form. Adequate

cleanout holes shall be provided at the bottom of each lift of forms. The size, number, and location of such clean-outs shall be as acceptable to the Engineer. Whenever concrete cannot be placed from the top of a wall form in a manner that meets the requirements of the Contract Documents, form windows shall be provided in the size and spacing needed to allow placement of concrete to the requirements of Section 03300, Cast-in-Place Concrete. The size, number, and location of such form windows shall be as acceptable to the Engineer.

3.03 CONSTRUCTION

A. Vertical Surfaces: All vertical surfaces of concrete members shall be formed, except where placement of the concrete against the ground is indicated. Not less than 1 inch of concrete shall be added to the thickness of the concrete member as indicated where concrete is permitted to be placed against trimmed ground in lieu of forms. Such permission will be granted only for members of comparatively limited height and where the character of the ground is such that it can be trimmed to the required lines and will stand securely without caving or sloughing until the concrete has been placed.

B. Construction Joints: Concrete construction joints will not be permitted at locations other than those indicated, except as may be acceptable to the Engineer. When a second lift is placed on hardened concrete, special precautions shall be taken in the way of the number, location, and tightening of ties at the top of the old lift and bottom of the new to prevent any unsatisfactory effect whatsoever on the concrete. Pipe stubs and anchor bolts shall be set in the forms where required.

C. Form Ties:

1. Embedded Ties: Holes left by the removal of form tie cones shall be reamed with suitable toothed reamers so as to leave the surface of the holes clean and rough before being filled with mortar as indicated for "Finish of Concrete Surfaces" in Section 03300, Cast-in-Place Concrete. Wire ties for holding forms will not be permitted. No form tying device or part thereof, other than metal, shall be left embedded in the concrete. Ties shall not be removed in such manner as to leave a hole extending through the interior of the concrete members. The use of snap ties that cause spalling of the concrete upon form stripping or tie removal will not be permitted. If steel panel forms are used, rubber grommets shall be provided where the ties pass through the form in order to prevent loss of cement paste. Where metal rods extending through the concrete are used to support or to strengthen forms, the rods shall remain embedded and shall terminate not less than 1 inch back from the formed face or faces of the concrete.

2. Removable Ties: Where taper ties are approved for use, the larger end of the taper tie shall be on the wet side of walls in water retaining structures. After the taper tie is removed, the hole shall be thoroughly cleaned and roughened for bond. A precast neoprene or polyurethane tapered plug shall be located at the wall centerline. The hole shall be completely filled with nonshrink grout for water bearing and below grade walls. The hole shall be completely filled with nonshrink or regular cement grout for above-grade walls that are dry on both sides. Exposed faces of walls shall have the outer 2 inches of the exposed face filled with a cement grout that shall match the color and texture of the surrounding wall surface.

3.04 REUSE OF FORMS

A. Forms may be reused only if in good condition and only if acceptable to the Engineer. Light sanding between uses will be required wherever necessary to obtain uniform surface texture on all exposed concrete surfaces. Exposed concrete surfaces are defined as surfaces which are permanently exposed to view. In the case of forms for the inside wall surfaces of hydraulic/water

retaining structures, unused tie rod holes in forms shall be covered with metal caps or shall be filled by other methods acceptable to the Engineer.

3.05 REMOVAL OF FORMS

A. Careful procedures for the removal of forms shall be strictly followed, and this work shall be done with care so as to avoid injury to the concrete. No heavy loading on green concrete will be permitted. In the case of roof slabs and above ground floor slabs, forms shall remain in place until test cylinders for the roof concrete attain a minimum compressive strength of 75 percent of the 28 day strength specified in Section 03300, Cast In Place Concrete; provided that no forms shall be disturbed or removed under an individual panel or unit before the concrete in the adjacent panel or unit has attained 75 percent of the 28 day strength, and has been in place for a minimum of 7 days. The time required to establish said strength shall be as determined by the Engineer who will make several test cylinders for this purpose from concrete used in the first group of roof panels placed. If the time so determined is more than the 7-day minimum, then that time shall be used as the minimum length of time. Forms for all vertical walls and columns shall remain in place at least 2 days after the concrete has been placed. Forms for all parts of the work not specifically mentioned herein shall remain in place for periods of time as determined by the Engineer.

3.06 MAINTENANCE OF FORMS

A. Forms shall be maintained at all times in good condition, particularly as to size, shape, strength, rigidity, tightness, and smoothness of surface. Forms, when in place, shall conform to the established alignment and grades. Before concrete is placed, the forms shall be thoroughly cleaned. The form surfaces shall be treated with a non-staining mineral oil or other lubricant acceptable to the Engineer. Any excess lubricant shall be satisfactorily removed before placing the concrete. Where field oiling of forms is required, the Contractor shall perform the oiling at least 2 weeks in advance of their use. Care shall be exercised to keep oil off the surfaces of steel reinforcement and other metal items to be embedded in concrete.

3.07 FALSEWORK

A. The Contractor shall be responsible for the design, engineering, construction, maintenance, and safety of all falsework, including staging, walkways, forms, ladders, and similar appurtenances, which shall equal or exceed the applicable requirements of the provisions of the OSHA Safety and Health Standards for Construction, and the requirements herein.

B. All falsework shall be designed and constructed to provide the necessary rigidity and to support the loads. Falsework for the support of a superstructure shall be designed to support the loads that would be imposed if the entire superstructure were placed at one time.

C. Falsework shall be placed upon a solid footing, safe against undermining, and protected from softening. When the falsework is supported on timber piles, the maximum calculated pile loading shall not exceed 20 tons. When falsework is supported on any portion of the structure which is already constructed, the load imposed by the falsework shall be spread, distributed, and braced in such a way as to avoid any possibility of damage to the structure.

END OF SECTION

SECTION 03200

REINFORCEMENT STEEL

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall provide concrete reinforcement steel, welded wire fabric, couplers, concrete inserts, wires, clips, supports, chairs, spacers, and other accessories, complete, all in accordance with the Contract Documents.

1.02 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Commercial Standards

1. American Concrete Institute (ACI):

   315 Details and Detailing of Concrete Reinforcement

   318 Building Code Requirements for Reinforced Concrete

   350 Building Code Requirements for Environmental Engineering Concrete Structures

2. American Society for Testing and Materials (ASTM):

   A 82 Steel Wire, Plain, for Concrete Reinforcement

   A 615 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

   A 706 Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement

3. American Welding Society (AWS):

   D1.4 Structural Welding Code - Reinforcing Steel

4. California Building Code (CBC)

5. Concrete Reinforcing Steel Institute (CRSI):

   MSP-1 Manual of Standard Practice.

1.03 SUBMITTALS

A. Furnish shop bending diagrams, placing lists, and drawings of all reinforcement steel prior to fabrication in accordance with Section 01300, Submittal Procedures.

B. Details of the concrete reinforcement steel and concrete inserts shall be submitted at the earliest possible date after receipt of the Notice to Proceed. Said details of reinforcement steel for fabrication and erection shall conform to ACI 315 and the requirements indicated. The shop bending diagrams shall show the actual lengths of bars, to the nearest inch measured to the intersection of the extensions (tangents for bars of circular cross section) of the outside surface. The Shop Drawings shall include bar placement diagrams which clearly indicate the dimensions of each bar splice.

C. Where mechanical couplers are required or permitted to be used to splice reinforcement steel, submit Manufacturer's literature which contains instructions and recommendations for installation for each type of coupler used; certified test reports which verify the load capacity of each type and

size of coupler used; and Shop Drawings which show the location of each coupler with details of how they are to be installed in the formwork.

D. If reinforcement steel is spliced by welding at any location, submit mill test reports which contain the information necessary for the determination of the carbon equivalent as specified in AWS D1.4. Submit a written welding procedure for each type of weld for each size of bar which is to be spliced by welding; merely a statement that AWS procedures will be followed is not acceptable.

1.04 QUALITY ASSURANCE

A. If requested by the Engineer, furnish samples from each heat of reinforcement steel delivered in a quantity adequate for testing. Costs of initial tests will be paid by the City. Costs of additional tests due to material failing initial tests shall be paid by the Contractor at no increased cost to the City.

B. If reinforcement steel is spliced by welding at any location, submit certifications of procedure qualifications for each welding procedure used and certification of welder qualifications, for each welding procedure, and for each welder performing the work. Such qualifications shall be as in accordance with AWS D1.4.

C. If requested by the Engineer, furnish samples of each type of welded splice used in the work in a quantity and of dimensions adequate for testing. At the discretion of the Engineer, radiographic testing of direct butt-welded splices will be performed. Provide assistance necessary to facilitate testing. Repair any weld which fails to meet the requirements of AWS D1.4. The costs of testing will be paid by the City; except, the costs of all tests which fail to meet requirements shall be paid by the Contractor at no increase in cost to the City.

PART 2 - MATERIALS

2.01 MATERIAL REQUIREMENTS

A. Materials which may remain or leave residues on or within the concrete shall be classified as acceptable for potable water use by the Environmental Protection Agency within 30 days of application or use.

2.02 REINFORCEMENT STEEL

A. Reinforcement Steel for all cast-in-place reinforced concrete construction shall conform to the following requirements:

1. Bar reinforcement shall conform to the requirements of ASTM A 615 for Grade 60 Billet Steel Reinforcement or be as otherwise indicated.
2. Bar reinforcement to be welded shall be deformed bars confirming to the requirements of A706, Grade 60.
3. Spiral reinforcement shall be cold-drawn steel wire conforming to the requirements of ASTM A 82.

B. Accessories

1. Accessories shall include all necessary chairs, slab bolsters, concrete blocks, tie wires, dips, supports, spacers, and other devices to position reinforcement during concrete placement. All bar supports shall meet the requirements of the CRSI Manual of Standard Practice

including special requirements for supporting epoxy coated reinforcing bars. Wire bar supports shall be CRSI Class 1 for maximum protection with a 1/8-inch minimum thickness of plastic coating that extends at least 1/2 inch from the concrete surface. Plastic shall be gray in color.

2. Concrete blocks (dobies), used to support and position reinforcement steel, shall have the same or higher compressive strength as required for the concrete in which it is located. Wire ties shall be embedded in concrete block bar supports.

2.03 MECHANICAL COUPLERS

A. Mechanical couplers shall be provided where indicated and where approved by the Engineer. The couplers shall develop a tensile strength which exceeds 125 percent of the yield strength of the reinforcement bars being spliced at each splice.

B. Where the type of coupler used is composed of more than one component, all components required for a complete splice shall be supplied. This shall apply to all mechanical splices, including those splices intended for future connections.

C. The reinforcement steel and coupler used shall be compatible for obtaining the required strength of the connection. Straight threaded type couplers shall require the use of the next larger size reinforcing bar or shall be used with reinforcing bars with specially forged ends which provide upset threads which do not decrease the basic cross section of the bar.

D. Couplers shall be:

1. Lenton Form Saver as manufactured by Erico Products;
2. Dowel Bar Splicer System as manufactured by Richmond Screw Anchor Company;
3. or equal.

2.04 WELDED SPLICES

A. Welded splices shall be provided where indicated and where approved by the Engineer. All welded splices of reinforcement steel shall develop a tensile strength which exceeds 125 percent of the yield strength of the reinforcement bars which are connected.

B. All materials required to conform the welded splices to the requirements of AWS D1.4 shall be provided.

PART 3 - EXECUTION

3.01 GENERAL

A. All reinforcement steel, couplers, and other appurtenances shall be fabricated, and placed in accordance with the requirements of the California Building Code and the supplementary requirements indicated herein.

3.02 FABRICATION

A. General:

1. Reinforcement steel shall be accurately formed to the dimensions and shapes indicated, and the fabricating details shall be prepared in accordance with ACI 315 and ACI 318,

except as modified by the Drawings. Stirrups and tie bars shall be bent around a pin having a diameter not less than 1-1/2 inch for No. 3 bars, 2 inch for No. 4 bars, and 2 1/2 inch for No. 5 bars. Bends for other bars shall be made around a pin having a diameter not less than six times the bar diameter, except for bars larger than 1 inch, in which case the bends shall be made around a pin of 8 bar diameters. Bars shall be bent cold.

2. Fabricate reinforcement bars for structures in accordance with bending diagrams, placing lists, and placing Drawings. Said drawings, diagrams, and lists shall be submitted in accordance with Section 01300, Submittal Procedures.

B. Fabricating Tolerances: Bars used for concrete reinforcement shall meet the following requirements for fabricating tolerances:

1. Sheared Length: + 1 inch

2. Depth of Truss Bars: + 0, - 1/2 inch

3. Stirrups, Ties, and Spirals: + 1/2 inch

4. All Other Bends: + 1 inch

3.03 PLACING

A. Reinforcement steel shall be accurately positioned as indicated and shall be supported and wired together to prevent displacement, using annealed iron wire ties or suitable clips at intersections. All reinforcement steel shall be supported by concrete, plastic or metal supports, spacers or metal hangers which are strong and rigid enough to prevent any displacement of the reinforcement steel. Where concrete is to be placed on the ground, supporting concrete blocks (or dobies) shall be used, in sufficient numbers to support the bars without settlement, but in no case shall such support be continuous. All concrete blocks used to support reinforcement steel shall be tied to the steel with wire ties which are embedded in the blocks. For concrete over formwork, furnish concrete, metal, plastic, or other acceptable bar chairs and spacers. Stop reinforcing bars as indicated in the most current edition of the California Building Code Section 1907.7.

B. Limitations on the use of bar support materials shall be as follows:

1. Concrete Dobies: Permitted at all locations except where architectural finish is required.

2. Wire Bar Supports: Permitted only at slabs over dry areas, interior dry wall surfaces, and exterior wall surfaces.

3. Plastic Bar Supports: Permitted at all locations except on grade.

C. Tie wires shall be bent away from the forms in order to provide the indicated concrete coverage.

D. Bars additional to those indicated which may be found necessary or desirable by the Contractor for the purpose of securing reinforcement in position shall be provided by the Contractor at no increased cost to the City.

E. Unless otherwise indicated, reinforcement placing tolerances shall be within the limits specified in Section 7.5 of ACI 318 except where in conflict with the requirements of the California Building Code.

F. Bars may be moved as necessary to avoid interference with other reinforcement steel, conduits, or embedded items. If bars are moved more than one bar diameter, or enough to exceed the above tolerances, the resulting arrangement of bars shall be as acceptable to the Engineer.

G. Welded wire fabric reinforcement placed over horizontal forms shall be supported on slab bolsters. Slab bolsters shall be spaced not more than 30-inches on centers, shall extend continuously across the entire width of the reinforcement mat, and shall support the reinforcement mat in the plane indicated.

H. Welded wire fabric placed over the ground shall be supported on wired concrete blocks (dobies) spaced not more than 3 feet on centers in any direction. The construction practice of placing welded wire fabric on the ground and hooking into place in the freshly placed concrete shall not be used.

I. Accessories supporting reinforcing bars shall be spaced such that there is no deflection of the accessory from the weight of the supported bars. When used to space the reinforcing bars from wall forms, the forms and bars shall be located so that there is no deflection of the accessory when the forms are tightened into position.

3.04 SPACING OF BARS

A. The clear distance between parallel bars (except in columns and between multiple layers of bars in beams) shall be not less than the nominal diameter of the bars nor less than 1 1/3 times the maximum size of the coarse aggregate, nor less than 1 inch.

B. Where reinforcement in beams or girders is placed in two or more layers, the clear distance between layers shall be not less than 1 inch.

C. In columns, the clear distance between longitudinal bars shall be not less than 1-1/2 times the bar diameter, nor less than 1-1/2 times the maximum size of the coarse aggregate, nor less than 1-1/2 inches.

D. The clear distance between bars shall also apply to the distance between a contact splice and adjacent splices or bars.

3.05 SPLICING

A. General: Reinforcement bar splices shall only be used at locations indicated. When it is necessary to splice reinforcement at other locations, the character of the splice shall be as acceptable to the Engineer.

B. Splices of Reinforcement:

1. The length of lap for reinforcement bars, unless otherwise indicated shall be in accordance with the latest edition of ACI 318, Section 12.15.1 for a Class B splice.

2. Laps of welded wire fabric shall be in accordance with the latest edition of ACI 318. Adjoining sheets shall be securely tied together with No. 14 tie wire, one tie for each 2 running feet. Wires shall be staggered and tied in such a manner that they cannot slip.

3. Splices in column spiral reinforcement, when necessary, shall be made by welding or by a lap of 1 1/2 turns.

C. Bending or Straightening: Reinforcement shall not be straightened or rebent in a manner which will injure the material. Bars with kinks or bends not indicated shall not be used. All bars shall be bent cold, unless otherwise permitted by the Engineer. No bars partially embedded in concrete shall be field-bent except as indicated or specifically permitted by the Engineer.

D. Couplers which are located at a joint face shall be a type which can be set either flush or recessed from the face as indicated. The couplers shall be sealed during concrete placement to completely eliminate concrete or cement paste from entering. Couplers intended for future connections shall be recessed a minimum of 1/2 inch from the concrete surface. After the concrete is placed, the coupler shall be plugged with plastic plugs which have an O ring seal and the recess filled with sealant to prevent any contact with water or other corrosive materials. Threaded couplers shall be plugged.

E. Unless noted otherwise, mechanical coupler spacing and capacity shall match the spacing and capacity of the reinforcing shown for the adjacent section.

3.06 CLEANING AND PROTECTION

A. Reinforcement steel shall at all times be protected from conditions conducive to corrosion until concrete is placed around it.

B. The surfaces of all reinforcement steel and other metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar and other foreign substances immediately before the concrete is placed. Where there is delay in depositing concrete, reinforcement shall be reinspected and, if necessary recleaned.

END OF SECTION

SECTION 03290

JOINTS IN CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall provide joints in concrete at the locations indicated, complete, in accordance with the Contract Documents.

1.02 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Federal Specifications:

1. TT-S-0227E (3)Sealing Compound, elastomeric type, Multi-component for Caulking, Sealing, and Glazing Buildings and Other Structures.

B. U.S. Army Corps of Engineers Specifications:

1. CRD-C572 PVC Waterstop

C. Commercial Standards:

1. American Society for Testing and Materials (ASTM):

A775 Epoxy-Coated Reinforcing Steel Bars

C 920 Elastomeric Joint Sealants

D 412 Test Methods for Rubber Properties in Tension

D 624 Test Method for Rubber Property -- Tear Resistance

D 638 Test Method for Tensile Properties of Plastics

D 746 Test Method for Brittleness Temperature of Plastics and Elastomers by Impact

D 747 Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam

D 1056 Flexible Cellular Materials -- Sponge or Expanded Rubber

D 1752 Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

D 2000 Standard Classification System for Rubber Products in Automotive Applications

D 2240 Test Method for Rubber Property -- Durometer Hardness

D 2241 Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR-Series)

2. California Building Code (CBC).

1.03 TYPES OF JOINTS

A. Construction Joints: When fresh concrete is placed against a hardened concrete surface, the joint between the two pours is called a construction joint. Unless otherwise indicated, all joints in water

bearing members shall be provided with a waterstop and/or sealant groove of the shape indicated. The surface of the first pour may also be required to receive a coating of bond breaker as indicated.

B. Contraction Joints: Contraction joints are similar to construction joints except that the fresh concrete shall not bond to the hardened surface of the first pour, which shall be coated with a bond breaker. The slab reinforcement shall be stopped 4 1/2 inches from the joint; which is provided with a sleeve-type dowel, to allow shrinkage of the concrete of the second pour. Waterstop and/or sealant groove shall also be provided when indicated.

C. Expansion Joints: To allow the concrete to expand freely, a space is provided between the two pours; the joint shall be formed as indicated. This space is obtained by placing a filler joint material against the first pour, which acts as a form for the second pour. Unless otherwise indicated, all expansion joints in water bearing members shall be provided with a center bulb type waterstop as indicated.

D. Premolded expansion joint material shall be installed with the edge at the indicated distance below or back from finished concrete surface, and shall have a slightly tapered, dressed, and oiled wood strip secured to or placed at the edge thereof during concrete placement, which shall later be removed to form space for sealing material.

E. The space so formed shall be filled with a joint sealant material as indicated below. In order to keep the two wall or slab elements in line the joint shall also be provided with a sleeve type dowel as indicated.

F. Control Joints: The function of the control joint is to provide a weaker plane in the concrete, where shrinkage cracks will probably occur. A groove, of the shape and dimensions indicated, is formed or saw-cut in the concrete. This groove is afterward filled with a joint sealant material as indicated below.

1.04 SUBMITTALS

A. Submittals shall be made in accordance with Section 01300, Submittal Procedures.

B. Waterstops: Prior to production of the material required under this contract, qualification samples shall be submitted. Such samples shall consist of extruded or molded sections of each size or shape to be used and shall be accomplished so that the material and workmanship represents in all respects the material to be provided under this contract. The balance of the material to be used under this contract shall not be produced until after the Engineer has reviewed the qualification samples.

C. Joint Sealant: Prior to ordering the sealant material, submit for the Engineer's review sufficient data to show general compliance with the requirements of the Contract Documents.

D. Certified test reports from the sealant Manufacturer on the actual batch of material being supplied indicating compliance with the above requirements shall be furnished to the Engineer before the sealant is used on the job.

E. Shipping Certification: Furnish written certification from the Manufacturer as an integral part of the shipping form, to show that all of the material shipped to this project meets or exceeds the physical property requirements of the Contract Documents. Supplier certificates are not acceptable.

F. Joint Location: Submit placement Shop Drawings showing the location and type of all joints for each structure.

1.05 QUALITY ASSURANCE

A. Waterstop Inspection: It is required that all waterstop field joints shall be subject to rigid inspection, and no such work shall be scheduled or started without having made prior arrangements with the Engineer to provide for the required inspections. Not less than 24 hours' notice shall be given to the Engineer for scheduling such inspections.

B. All field joints in waterstops shall be subject to rigid inspection for misalignment, bubbles, inadequate bond, porosity, cracks, offsets, and other defects which would reduce the potential resistance of the material to water pressure at any point. All defective joints shall be replaced with material which shall pass said inspection, and all faulty material shall be removed from the site and disposed of by the Contractor at no increase in cost to the City.

C. The following waterstop defects represent a partial list of defects which shall be grounds for rejection:

1. Offsets at joints greater than 1/16 inch or 15 percent of material thickness, at any point, whichever is less.
2. Exterior crack at joint, due to incomplete bond, which is deeper than 1/16 inch or 15 percent of material thickness, at any point, whichever is less.
3. Any combination of offset or exterior crack which will result in a net reduction in the cross section of the waterstop in excess of 1/16 inch or 15 percent of material thickness at any point, whichever is less.
4. Misalignment of joint which result in misalignment of the waterstop in excess of 1/2 inch in 10 feet.
5. Porosity in the welded joint as evidenced by visual inspection.
6. Bubbles or inadequate bonding which can be detected with a penknife test. If, while prodding the entire joint with the point of a penknife, the knife breaks through the outer portion of the weld into a bubble, the joint shall be considered defective.

D. Waterstop Samples: Prior to use of the waterstop material in the field, a sample of a fabricated mitered cross and a tee constructed of each size or shape of material to be used shall be submitted to the Engineer for review. These samples shall be fabricated so that the material and workmanship represent in all respects the fittings to be provided under this contract. Field samples of fabricated fittings will be selected at random by the Engineer for testing by a laboratory at the City's expense. When tested, they shall have a tensile strength across the joints equal to at least 600 psi.

E. Construction Joint Sealant: Prepare adhesion and cohesion test specimens as indicated, at intervals of 5 working days while sealants are being installed.

F. The sealant material shall show no signs of adhesive or cohesive failure when tested in accordance with the following procedure in laboratory and field tests:

1. Sealant specimen shall be prepared between two concrete blocks (1 inch by 2 inches by 3 inches). Spacing between the blocks shall be 1 inch. Coated spacers (2 inches by 1 1/2 inches by 1/2 inch) shall be used to insure sealant cross sections of 1/2 inch by 2 inches with a width of 1 inch.
2. Sealant shall be cast and cured according to Manufacturer's recommendations except that curing period shall be not less than 24 hours.

3. Following curing period, the gap between blocks shall be widened to 1 1/2 inch. Spacers shall be used to maintain this gap for 24 hours prior to inspection for failure.

1.06 GUARANTEE

A. The Contractor shall warranty the sealant installation against defects in workmanship and material for a period of 5 years. Warranty documents shall be submitted prior to final acceptance of the project which specifically state that the Contractor will repair or replace defective sealants to the satisfaction of the City within the 5-year period.

PART 2 - MATERIALS

2.01 GENERAL

A. All joint materials herein shall be classified as acceptable for potable water use, by the Environmental Protection Agency, within 30 days of application.

2.02 PVC WATERSTOPS

A. General: Waterstops shall be extruded from an elastomeric polyvinyl chloride compound containing the plasticizers, resins, stabilizers, and other materials necessary to meet the requirements of these Specifications. No reclaimed or scrap material shall be used. Obtain from the waterstop Manufacturer and furnish to the Engineer for review, current test reports and a written certification of the Manufacturer that the material to be shipped to the job meets the physical requirements as outlined in the U.S. Army Corps of Engineers Specification CRD-C572 and those listed herein.

B. Flatstrip Waterstops shall be manufactured by:

1. Kirkhill Rubber Co., Brea, CA;
2. Water Seals, Inc., Chicago, IL;
3. Progress Unlimited, Inc., New York, NY;
4. Greenstreak Plastic Products Co., St. Louis, MO;
5. or equal;

provided, that at no place shall the thickness of flat strip waterstops be less than 3/8 inch.

C. Multi-Rib Waterstops, where required, shall be manufactured by:

1. Water Seals, Inc., Chicago, IL;
2. Progress Unlimited, Inc., New York, NY;
3. Greenstreak Plastic Products Co., St. Louis, MO;
4. or equal.

Prefabricated joint fittings shall be used at all intersections of the ribbed type waterstops.

D. Expansive Waterstops for construction joints where shown on the Drawings: Preformed hydrophilic rubber seals. Installation adhesives used with the expansive waterstops shall be as recommended by the waterstop manufacturer. The waterstop shall be Adeka Ultraseal MC-2010MN as distributed by Mitsubishi of Houston, TX; Hydrotite CJ-1020-2K by Greenstreak Plastic Products, St. Louis, MO, or equal.

E. Other Types of Waterstops: When other types of waterstops, not listed above are required and indicated, they shall be subjected to the same requirements as those listed herein.

F. Waterstop Testing Requirements: When tested in accordance with the standards, the waterstop material shall meet or exceed the following requirements:

Physical Property, Sheet Material	Value	ASTM Std.
Tensile Strength-min (psi)	1,750	D 638, Type IV
Ultimate Elongation-min (percent)	350	D 638, Type IV
Low Temp Brittleness-max	-35	D 746
(degrees F)		
Stiffness in Flexure-min (psi)	400	D 747
Accelerated Extraction (CRD-C572)		
Tensile Strength-min (psi)	1,500	D 638, Type IV
Ultimate Elongation-min (percent)	300	D 638, Type IV
Effect of Alkalis (CRD-C572)		
Change in Weight (percent)	+0.25/-0.10	
Change in Durometer, Shore A	+5	D 2240
Finish Waterstop		
Tensile Strength-min (psi)	1,400	D 638, Type IV
Ultimate Elongation-min (percent)	280	D 638, Type IV

2.03 JOINT SEALANT

A. Joint sealant shall be polyurethane polymer designed for bonding to concrete which is continuously submerged in water. No material will be acceptable which has an unsatisfactory history to bond or durability when used in the joints of water retaining structures.

B. Joint sealant material shall meet the following requirements (73 degrees F and 50 percent R.H.):

Work Life	45 - 180 minutes
Time to Reach 20 Shore "A" Hardness	24 hours, maximum
(at 77 degrees F, 200 gr quantity)	
Ultimate Hardness (ASTM D 2240)	20 - 45 Shore "A"
Tensile Strength (ASTM D 412)	200 psi, minimum

Ultimate Elongation (ASTM D 412)	400 percent, minimum
Tear Resistance (Die C ASTM D 624)	75 pounds per inch of thickness, minimum
Color	Light Gray

C. All polyurethane sealants for waterstop joints in concrete shall conform to the following requirements:

1. Sealant shall be two-part polyurethane with the physical properties of the cured sealant conforming to or exceeding the requirements of ANSI/ASTM C 920 or Federal Specification TT S 0227 E(3) for two-part material, applicable.
2. For vertical joints and overhead horizontal joints, only "nonsag" compounds shall be used; all such compounds shall conform to the requirements of ANSI/ASTM C 920 Class 25, Grade NS, or Federal Specification TT S 0227 E(3), Type II, Class A.
3. For plane horizontal joints, the self-leveling compounds which meet the requirements of ANSI/ASTM C 920 Class 25, Grade P, or Federal Specification TT S 0227 E(3), Type I shall be used. For joints subject to either pedestrian or vehicular traffic, a compound providing nontracking characteristics, and having a Shore "A" hardness range of 35 to 45, shall be used.
4. Primer materials, if recommended by the sealant Manufacturer, shall conform to the printed recommendations of the sealant Manufacturer.

D. All sealants, wherever shown, or required hereunder shall be PSI 270 manufactured by:

1. Polymeric Systems, Inc.;
2. Elastothane 227R manufactured by Pacific Polymers;
3. Sikaflex 2C, manufactured by Sika Corporation;
4. or equal.

E. Sealants for nonwaterstop joints in concrete shall conform to the following requirements:

1. Joint Sealant shall be a multipart, gray, nonstaining, nonsagging, polyurethane sealant, which cures at ambient temperature to a firm, flexible, resilient, tear resistant rubber.
2. Sealant shall be RC 270 of Products Research and Chemical Corporation, Mameco International Vulkem 277, Multi Chem MC287, or equal.

2.04 JOINT MATERIALS

A. Bearing Pad: Neoprene conforming to ASTM D 2000 BC 420, 40 durometer hardness, unless otherwise indicated.

B. Neoprene Sponge: Neoprene, closed-cell, expanded, conforming to ASTM D 1056, Type 2C3 E1.

C. Joint Filler:

1. Joint filler for expansion joints in water holding structures shall be neoprene conforming to ASTM D 1056, Type 2C5 E1.
2. Joint filler material in other locations shall be of the preformed nonextruding type joint filler constructed of cellular neoprene sponge rubber or polyurethane of firm texture. Bituminous fiber type will not be permitted. All nonextruding and resilient-type preformed

expansion joint fillers shall conform to the requirements and tests set forth in ASTM D 1752 for Type I, except otherwise indicated.

2.05 BACKING ROD

A. Backing rod shall be an extruded closed-cell, polyethylene foam rod. The material shall be compatible with the joint sealant material used and shall have a tensile strength of not less than 40 psi and a compression deflection of approximately 25 percent at 8 psi. The rod shall be 1/4 inch larger in diameter than the joint width except that a 1-inch diameter rod shall be used for a 3/4 inch wide joint.

2.06 BOND BREAKER

A. Bond breaker shall be:

1. Super Bond Breaker manufactured by Burke Company, San Mateo, CA;
2. Select Cure CRB manufactured by Select Products Co., Upland, CA;
3. or equal.

B. It shall contain a fugitive dye so that areas of application will be readily distinguishable. Bond breaker shall have positive bond prevention.

2.07 SLIP DOWELS

A. Slip dowels in joints shall be A 36 smooth epoxy-coated bars, conforming to ASTM A 775.

2.08 PVC TUBING

A. PVC tubing in joints shall be Sch. SDR 13.5, conforming to ASTM D 2241.

PART 3 - EXECUTION

3.01 GENERAL

A. Waterstops of the type indicated shall be embedded in the concrete across joints indicated. All waterstops shall be fully continuous for the extent of the joint. Splices necessary to provide such continuity shall be accomplished in conformance to printed instructions of Manufacturer of the waterstops. Take suitable precautions and means to support and protect the waterstops during the progress of the work and repair or replace any waterstops damaged during the progress of the work. All waterstops shall be stored so to permit free circulation of air around the waterstop material.

B. When any waterstop is installed in the concrete on one side of a joint, while the other half or portion of the waterstop remains exposed to the atmosphere for more than 2 days, suitable precautions shall be taken to shade and protect the exposed waterstop from direct rays of the sun during the entire exposure and until the exposed portion of the waterstop is embedded in concrete.

3.02 SPLICES IN WATERSTOPS

A. Splices in waterstops shall be performed by heat sealing the adjacent waterstop sections in accordance with the Manufacturer's printed recommendations. The technician who performs waterstop fusion requires representative training and certification. It is essential that:

1. The material not be damaged by heat sealing.

2. The splices have a tensile strength of not less than 60 percent of the unspliced materials tensile strength.

3. The continuity of the waterstop ribs and of its tubular center axis be maintained.

B. Butt joints of the ends of two identical waterstop sections may be made while the material is in the forms.

C. All joints with waterstops involving more than two ends to be jointed together, and all joints which involve an angle cut, alignment change, or the joining of two dissimilar waterstop sections shall be prefabricated prior to placement in the forms, allowing not less than 24-inch long strips of waterstop material beyond the joint. Upon being inspected and approved, such prefabricated waterstop joint assemblies shall be installed in the forms and the ends of the 24-inch strips shall be butt welded to the straight run portions of waterstop in place in the forms.

3.03 JOINT CONSTRUCTION

A. Setting Waterstops: In order to eliminate faulty installation that may result in joint leakage, particular care shall be taken of the correct positioning of the waterstops during installation. Adequate provisions must be made to support and anchor the waterstops during the progress of the work and to insure the proper embedment in the concrete. The symmetrical halves of the waterstops shall be equally divided between the concrete pours at the joints. The center axis of the waterstops shall be coincident with the joint openings. Maximum density and imperviousness of the concrete shall be insured by thoroughly working it in the vicinity of all joints.

B. In placing flat-strip waterstops in the forms, means shall be provided to prevent them from being folded over by the concrete that is placed. Unless otherwise indicated, all waterstops shall be held in place with light wire ties on 12-inch centers which shall be passed through the edge of the waterstop and tied to the curtain of reinforcing steel. Horizontal waterstops, with their flat face in a vertical plane, shall be held in place with continuous supports to which the top edge of the waterstop shall be tacked. In placing concrete around horizontal waterstops, with their flat face in a horizontal plane, concrete shall be worked under the waterstops by hand to avoid the formation of air and rock pockets.

C. Waterstops in vertical wall joints shall stop 6 inches from the top of the wall where such waterstop does not connect with any other waterstop and is not to be connected to for a future concrete placement.

D. Joint Location: Construction joints, and other types of joints, shall be provided where indicated. When not indicated, construction joints shall be provided at 25-foot maximum spacing for all concrete construction, unless indicated otherwise. Where joints are indicated spaced greater than 40 feet apart, additional joints shall be provided to maintain the 25-foot maximum spacing. The location of all joints, of any type, shall be submitted for acceptance by the Engineer.

E. Joint Preparation: Special care shall be used in preparing concrete surfaces at joints where bonding between two sections of concrete is required. Unless otherwise indicated, such bonding will be required at all horizontal joints in walls. Surfaces shall be prepared in accordance with the requirements of Section 03300, Cast-in-Place Concrete. Except on horizontal wall construction joints, wall to slab joints or where otherwise indicated, at all joints where waterstops are required, the joint face of the first pour shall be coated with a bond breaker indicated herein.

F. Construction Joint Sealant: Construction joints in water-bearing floor slabs, and elsewhere indicated, shall be provided with tapered grooves which shall be filled with a construction joint sealant. The material used for forming the tapered grooves shall be left in the grooves until just before the grooves are cleaned and filled with joint sealant. After removing the forms from the grooves, all laitance and fins shall be removed, and the grooves shall be sand-blasted. The grooves shall be allowed to become thoroughly dry, after which they shall be blown out; immediately thereafter, they shall be primed, bond breaker tape placed in the bottom of the groove and filled with the construction joint sealant. The primer used shall be supplied by the same Manufacturer supplying the sealant. No sealant will be permitted to be used without a primer. Care shall be used to completely fill the sealant grooves. Areas designated to receive a sealant fillet shall be thoroughly cleaned and outlined for the tapered grooves prior to application of the sealant.

G. The primer and sealant shall be placed strictly in accordance with the printed recommendations of the Manufacturer, taking special care to properly mix the sealant prior to application. The sides of the sealant groove shall not be coated with bond breaker, curing compound, or any other substance which would interfere with proper bonding of the sealant. All sealant shall achieve final cure at least 7 days before the structure is filled with water.

H. All sealant shall be installed by a competent waterproofing specialty contractor who has a successful record of performance in similar installations. Before work commences, the crew doing the work shall be instructed to the proper method of application by a representative of the sealant Manufacturer.

I. Thorough, uniform mixing of two-part, catalyst-cured materials is essential; special care shall be taken to properly mix the sealer before its application. Before any sealer is placed, arrange to have the crew doing the work carefully instructed to the proper method of mixing and application by a representative of the sealant Manufacturer.

1. Any joint sealant which, after the Manufacturer's recommended curing time for the job conditions of the work hereunder, fails to fully and properly cure shall be completely removed; the groove shall be thoroughly sandblasted to remove all traces of the uncured or partially cured sealant and primer, and shall be resealed with the indicated joint sealant. All costs of such removal, joint treatment, resealing, and appurtenant work shall be at no additional cost to the City.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall provide finished concrete, complete, in accordance with the Contract Documents.

B. The following types of concrete shall be covered in this section:

1. Structural Concrete: Concrete to be used in all cases except where noted otherwise in the Contract Documents.

2. Sitework Concrete: Concrete to be used for curbs, gutters, catch basins, sidewalks, pavements, fence and guard post embedment, underground duct bank encasement and all other concrete appurtenant to electrical facilities unless otherwise indicated.

3. Lean Concrete: Concrete to be used for thrust blocks, anchor blocks, pipe trench cut off blocks and cradles, where the preceding items are detailed on the Drawings as unreinforced. Concrete to be used as protective cover for dowels intended for future connection.

C. The term "hydraulic structure" used in these Specifications shall refer to environmental engineering concrete structures for the containment, treatment, or transmission of water, wastewater, or other fluids. A hydraulic structure encompasses all of its component parts including, but not limited to, the walls, floor slabs, columns, column foundations, beams, drop panels, roof structure and other ancillary structural components.

1.02 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Federal Specifications:

UU-B-790A (1) (2) Building Paper, Vegetable Fiber (Kraft, Waterproofed, Water Repellant and Fire Resistant)

B. Commercial Standards:

1. American Concrete Institute (ACI):

117 Standard Tolerances for Concrete Construction and Materials

214 Recommended Practice for Evaluation of Strength Test Results of Concrete

301 Structural Concrete for Buildings

304R Recommended Practice for Measuring Mixing, Transporting and Placing Concrete

305R Hot Weather Concreting

306 Cold Weather Concreting

309 Consolidation of Concrete

315 Details and Detailing of Concrete Reinforcement

318 Building Code Requirements for Reinforced Concrete

336.1 Specification for the Construction of Drilled Piers

350R Environmental Engineering Concrete Structures

2. American Society for Testing and Materials (ASTM):

C 31 Practice for Making and Curing Concrete Test Specimens in the Field

C 33 Concrete Aggregates

C 39 Test Method for Compressive Strength of Cylindrical Concrete Specimens

C 42 Test Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

C 94 Ready-Mixed Concrete

C 136 Test Method for Sieve Analysis of Fine and Coarse Aggregates

C 138 Test Method for Unit Weight, Yield, and Air Content of Concrete

C 143 Test Method for Slump of Hydraulic Cement Concrete

C 150 Portland Cement

C 156 Test Method for Water Retention by Concrete Curing Materials

C 157 Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete

C171 Specification for Sheet Materials for Curing Concrete

C 192 Practice for Making and Curing Concrete Test Specimens in the Laboratory

C 231 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method

C 260 Air-Entraining Admixtures for Concrete

C 309 Liquid Membrane-Forming Compounds for Curing Concrete

C 494 Chemical Admixtures for Concrete

C 1077 Practice for Laboratories Testing Concrete and Concrete Aggregates for use in Construction & Criteria for Laboratory Evaluation

D 448 Size of Aggregate for Road and Bridge Construction

D 1751 Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)

D 2419 Test Method for Sand Equivalent Value of Soils and Fine Aggregate

E 1643 Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs

E 1745 Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs

3. California Building Code (CBC).

1.03 SUBMITTALS

A. Mix Designs: Prior to beginning the work and within 14 days of the Notice to Proceed, submit to the Engineer, for review, preliminary concrete mix designs which shall show the proportions and gradations of all materials proposed for each class and type of concrete indicated herein in accordance with Section 01300, Submittal Procedures. The mix designs shall be checked and certified to conform to these Specifications by an independent testing laboratory acceptable to the Engineer. All costs related to such checking shall be borne by the Contractor at no increased cost to the City.

B. Delivery Tickets: Where ready-mix concrete is used, furnish delivery tickets at the time of delivery of each load of concrete. Each ticket shall show the state certified equipment used for measuring and the total quantities, by weight, of cement, sand, each class of aggregate, admixtures, and the amounts of water in the aggregate added at the batching plant, and the amount allowed to be added at the site for the specific design mix. In addition, each ticket shall state the mix number, total yield in cubic yards, and the time of day, to the nearest minute, corresponding to the times when the batch was dispatched, when it left the plant, when it arrived at the site, when unloading began, and when unloading was finished.

C. Furnish the following submittals in accordance with ACI 301:

1. Mill tests for cement.
2. Admixture certification. Chloride ion content must be included.
3. Aggregate gradation and certification.
4. Materials and methods for curing.

D. CIDH pier drilling, casing/slurry displacement and concrete placement plan. Submit a detailed installation plan describing the schedule for drilling and/or excavation, installation of steel reinforcement and concrete placement with anticipated site conditions so that each excavated shaft is poured the same day that the drilling is performed.

1.04 CONCRETE CONFERENCE

A. A meeting to review the detailed requirements of the Contractor's proposed concrete design mixes and to determine the procedures for producing proper concrete construction shall be held no later than 14 days after the Notice to Proceed.

B. All parties involved in the concrete work shall attend the conference, including the following:

1. Contractor's representative
2. Testing laboratory representative
3. Concrete subcontractor
4. Reinforcing steel subcontractor and detailer
5. Concrete supplier
6. Admixture Manufacturer's representative

C. The conference shall be held at a mutually agreed upon time and place. The Engineer shall be notified no less than 5 days prior to the date of the conference.

1.05 QUALITY ASSURANCE

A. General:

1. Tests on component materials and for compressive strength and shrinkage of concrete will be performed as specified herein. Test for determining slump will be in accordance with the requirements of ASTM C 143.

2. The City will engage the services of a material testing laboratory to perform testing for the purpose of verifying compliance with the project specifications.

3. The cost of all laboratory tests on cement, aggregates, and concrete will be borne by the City. However, the Contractor will be charged for the cost of any additional tests and investigation on work performed which does not meet the Specifications. The laboratory must meet or exceed the requirements of ASTM C 1077.

4. Concrete for testing shall be supplied by the Contractor at no cost to the City, and the Contractor shall assist the Engineer in obtaining samples, and disposal and cleanup of excess material.

B. Field Compression Tests:

1. Compression test specimens will be taken during construction from the first placement of each class of concrete specified herein and at intervals thereafter as selected by the Engineer to ensure continued compliance with these Specifications. Each set of test specimens will be a minimum of six cylinders.

2. Compression test specimens for concrete shall be made in accordance with Section 9.2 of ASTM C 31. Specimens shall be 6-inch diameter by 12-inch high cylinders.

3. Compression tests shall be performed in accordance with ASTM C 39. One test cylinder will be tested at 7 days and two at 28 days. The remaining cylinders will be held to verify test results, if needed.

C. Evaluation and Acceptance of Concrete:

1. Evaluation and acceptance of the compressive strength of concrete shall be according to the requirements of ACI 318, Chapter 5 "Concrete Quality, Mixing, and Placing" and as specified herein.

2. A statistical analysis of compression test results will be performed according to the requirements of ACI 214. The standard deviation of the test results shall not exceed 640 psi, when ordered at equivalent water content as estimated by slump.

3. If any concrete fails to meet these requirements, immediate corrective action shall be taken to increase the compressive strength for all subsequent batches of the type of concrete affected.

4. When the standard deviation of the test results exceeds 640 psi, the average strength for which the mix is designed shall be increased by an amount necessary to satisfy the statistical requirement that the probability of any test being more than 500 psi below or the average of any three consecutive tests being below the required compressive strength is 1 in 100. The required average strength shall be calculated by Criterion No. 3 of ACI 214 using the actual standard of deviation.

5. All concrete which fails to meet the ACI requirements and these Specifications, is subject to removal and replacement at no increase in cost to the City.

6. Test core wall concrete for total chlorides. Chloride ions shall not exceed 0.06 percent of the weight of the cement in the concrete.

D. Shrinkage Tests:

1. Drying shrinkage tests will be made for the trial batch specified in the Paragraph 2.08 in Part 2 entitled "Trial Batch and Laboratory Tests," the first placement of each class of concrete, and during construction to insure continued compliance with these Specifications.

2. Drying shrinkage specimens shall be 4 inch by 4 inch by 11 inch prisms with an effective gage length of 10 inches, fabricated, cured, dried and measured in accordance with ASTM C 157 modified as follows: specimens shall be removed from molds at an age of 23 ±1 hours after trial batching, shall be placed immediately in water at 70 degrees F ±3 degrees F for at least 30 minutes, and shall be measured within 30 minutes thereafter to determine original length and then submerged in saturated lime water at 73 degrees F ±3 degrees F. Measurement to determine expansion expressed as a percentage of original length shall be made at age 7 days. This length at age 7 days shall be the base length for drying shrinkage calculations ("0" days drying age). Specimens then shall be stored immediately in a humidity control room maintained at 73 degrees F ±3 degrees F and 50 percent ±4 percent relative humidity for the remainder of the test. Measurements to determine shrinkage expressed as percentage of base length shall be made and reported separately for 7, 14, 21, and 28 days of drying after 7 days of moist curing.

3. The drying shrinkage deformation of each specimen shall be computed as the difference between the base length (at "0" days drying age) and the length after drying at each test age. The average drying shrinkage deformation of the specimens shall be computed to the nearest 0.0001 inch at each test age. If the drying shrinkage of any specimen departs from the average of that test age by more than 0.0004 inch, the results obtained from that specimen shall be disregarded. Results of the shrinkage test shall be reported to the nearest 0.001 percent of shrinkage. Compression test specimens shall be taken in each case from the same concrete used for preparing drying shrinkage specimens. These tests shall be considered a part of the normal compression tests for the project. Allowable shrinkage limitations shall be as listed in Part 2, herein.

E. Construction Tolerances: Set and maintain concrete forms and perform finishing operations so as to ensure that the completed work is within the required tolerances. Surface defects and irregularities are defined as finishes and are to be distinguished from tolerances. Tolerance is the specified permissible variation from lines, grades, or dimensions indicated. Where tolerances are not stated in the Specifications, permissible deviations will be in accordance with ACI 117.

1. The following construction tolerances are hereby established and apply to finished walls and slab unless otherwise indicated:

Item	Tolerance
Variation of the constructed linear outline from the established position in plan.	In 10 feet: 1/4 inch; In 20 feet or more: 1/2 inch
Variation from the level or from the grades shown.	In 10 feet: 1/4 inch In 20 feet or more: 1/2 inch

Item	Tolerance
Variation from the plumb.	In 10 feet: 1/4 inch;
Variation in the thickness of slabs and walls.	Minus 1/4 inch; Plus 1/2 inch
Variation in the locations and sizes of slabs and wall openings.	Plus or minus 1/4 inch

PART 2 - MATERIALS

2.01 CONCRETE MATERIALS

A. General:

1. All materials specified herein shall be classified as acceptable for potable water use by the Environmental Protection Agency within 30 days of application.
2. Materials shall be delivered, stored, and handled so as to prevent damage by water or breakage. Cement reclaimed from cleaning bags or leaking containers shall not be used. All cement shall be used in the sequence of receipt of shipments.
3. It shall be the Contractor's responsibility to ensure that the color concrete has a consistent color from batch to batch and from day to day.

B. All materials furnished for the work shall comply with the requirements of Chapter 3 of ACI 318, as applicable.

C. Storage of materials shall conform to the requirements of Chapter 3, of ACI 318, or the Standard Specifications.

D. Materials for concrete shall conform to the following requirements:

1. Cement shall be standard brand portland cement conforming to ASTM C 150 for Type II/V, including Table 2 optional requirements. A minimum of 85 percent of cement by weight shall pass a 325 screen. A single brand of cement shall be used throughout the work, and prior to its use, the brand shall be acceptable to the Engineer. The cement shall be suitably protected from exposure to moisture until used. Cement that has become lumpy shall not be used. Sacked cement shall be stored in such a manner so as to permit access for inspection and sampling. Certified mill test reports, including fineness, for each shipment of cement to be used shall be submitted to the Engineer if requested regarding compliance with these Specifications.
2. Flyash is not permitted.
3. Water for mixing and curing shall be potable, clean, and free from objectionable quantities of silty organic matter, alkali, salts and other impurities. The water shall be considered potable, for the purposes of this section only, if it meets the requirements of the local governmental agencies. Agricultural water with high total dissolved solids (over 1,000 mg/l TDS) shall not be used.
4. Aggregates shall be obtained from pits acceptable to the Engineer, shall be nonreactive, and shall conform to ASTM C 33. Maximum size of coarse aggregate shall be as specified herein. Lightweight sand for fine aggregate will not be permitted.

a. Coarse aggregates shall consist of clean, hard, durable gravel, crushed gravel, crushed rock or a combination thereof. The coarse aggregates shall be prepared and handled in two or more size groups for combined aggregates with a maximum size greater than 3/4 inch. When the aggregates are proportioned for each batch of concrete the two size groups shall be combined. See the Paragraph 2.08 in Part 2 entitled "Trial Batch and Laboratory Tests" for the use of the size groups.

b. Fine aggregates shall be natural sand or a combination of natural and manufactured sand that are hard and durable. When tested in accordance with ASTM D 2419, the sand equivalency shall not be less than 75 percent for an average of three samples, nor less than 70 percent for an individual test. Gradation of fine aggregate shall conform to ASTM C 33, with 15 to 30 percent passing the number 50 screen and 5 to 10 percent passing the number 100 screen. The fineness modulus of sand used shall not be over 3.00.

c. Combined aggregates shall be well graded from coarse to fine sizes, and shall be uniformly graded between screen sizes to produce a concrete that has optimum workability and consolidation characteristics. Where a trial batch is required for a mix design, the final combined aggregate gradations will be established during the trial batch process.

d. When tested in accordance with ASTM C 33, the ratio of silica released to reduction in alkalinity shall not exceed 1.0.

e. When tested in accordance with ASTM C 33, the fine aggregate shall produce a color in the supernatant liquid no darker than the reference standard color solution.

f. When tested in accordance with ASTM C 33, the coarse aggregate shall show a loss not exceeding 42 percent after 500 revolutions, or 10.5 percent after 100 revolutions.

g. When tested in accordance with ASTM C 33, the loss resulting after five cycles shall not exceed 10 percent for fine or coarse aggregate when using sodium sulfate.

5. Ready-mix concrete shall conform to the requirements of ASTM C 94.

6. Admixtures: All admixtures shall be compatible and by a single Manufacturer capable of providing qualified field service representation. Admixtures shall be used in accordance with Manufacturer's recommendations. If the use of an admixture is producing an inferior end result, discontinue use of the admixture. Admixtures shall not contain thiocyanate nor more than 0.05 percent chloride ion, and shall be nontoxic after 30 days.

   a. Air entraining agent meeting the requirements of ASTM C 260, shall be used. Sufficient air entraining agent shall be used to provide a total air content of 3 to 5 percent. The City reserves the right, at any time, to sample and test the air-entraining agent received on the job. The air entraining agent shall be added to the batch in a portion of the mixing water. The solution shall be batched by means of a mechanical batcher capable of accurate measurement. Air content shall be tested at the point of placement. Air entraining agent shall be Darex II by W.R. Grace; AEA-92 by Euclid Chemical Company; or equal.

   b. Set controlling and water reducing admixtures: Admixtures may be added at the Contractor's option to control the set, effect water reduction, and increase workability. The addition of an admixture shall be at no increase in cost to the City. The use of an admixture shall be subject to acceptance by the Engineer. Concrete containing an admixture shall be first placed at a location determined by the Engineer. Admixtures specified herein shall conform to the requirements of

ASTM C 494. The required quantity of cement shall be used in the mix regardless of whether or not an admixture is used.

(1) Concrete shall not contain more than one water reducing admixture. Concrete containing an admixture shall be first placed at a location determined by the Engineer.

(2) Set controlling admixture shall be either with or without water-reducing properties. Where the air temperature at the time of placement is expected to be consistently over 80 degrees F, a set retarding admixture such as Eucon Retarder by Euclid Chemical Company; Daratard 17 by W.R. Grace; or equal shall be used. Where the air temperature at the time of placement is expected to be consistently under 40 degrees F, a noncorrosive set accelerating admixture such as Plastocrete 161FL by Sika Corporation; Pozzutec 20 by Master Builders; Daraset by W.R. Grace; or equal shall be used.

(3) Normal range water reducer shall conform to ASTM C 494, Type A or D. WRDA 64 by W.R. Grace; Eucon WR-91 by Euclid Chemical Company; or equal. The quantity of admixture used and the method of mixing shall be in accordance with the Manufacturer's instructions and recommendations.

(4) High range water reducer shall conform to ASTM C 494, Type F or G. ADVA 190 by W.R. Grace; Eucon 1037 by Euclid Chemical Co.; or equal. High range water reducer shall be added to the concrete after all other ingredients have been mixed and initial slump has been verified. No more than 14 ounces of water reducer per sack of cement shall be used. Water reducer shall be considered as part of the mixing water when calculating water cement ratio.

(5) If the high range water reducer is added to the concrete at the jobsite, it may be used in conjunction with the same water reducer added at the batch plant. Concrete shall have a slump of 3 inches ±1/2 inch prior to adding the high range water reducing admixture at the jobsite. The high range water reducing admixture shall be accurately measured and pressure injected into the mixer as a single dose by an experienced technician. A standby system shall be provided and tested prior to each day's operation of the jobsite system.

(6) Concrete shall be mixed at mixing speed for a minimum of 30 mixer revolutions after the addition of the high range water reducer.

2.02 CURING MATERIALS

A. Materials for curing concrete as specified herein shall conform to the following requirements and ASTM C 309:

1. All curing compounds (also sealers) shall be Type I, Class B and resin based. Sodium silicate compounds shall not be allowed.

2. Concrete curing compound shall be

   a. Spartan Cote Cure-Seal Hardener by the Burke Company;

   b. Super Rez Seal by Euclid Chemical Company;

   c. MB 429 as manufactured by Master Builders;

   d. or equal.

3. Water based resin curing compounds shall be used only where local air quality regulations prohibit the use of a solvent based compound. Water based curing compounds shall be

   a. Aqua Resincure by the Burke Company;

   b. Aqua-Cure by Euclid Chemical Company;

   c. Masterkure W by Master Builders;

   d. or equal.

4. Curing compounds shall be used where architectural finish schedule calls for the concrete to be provided with sealer.

5. Polyethylene sheet for use as concrete curing blanket shall be white, and shall have a nominal thickness of 6 mils. The loss of moisture when determined in accordance with the requirements of ASTM C 156 shall not exceed 0.055 grams per square centimeter of surface.

6. Polyethylene coated waterproof paper sheeting for use as concrete curing blanket shall consist of white polyethylene sheeting free of visible defects, uniform in appearance, having a nominal thickness of 2 mils and permanently bonded to waterproof paper conforming to the requirements of Federal Specification UU B 790A (1) (2). The loss of moisture, when determined in accordance with the requirements of ASTM C 156, shall not exceed 0.055 gram per square centimeter of surface.

7. Polyethylene coated burlap for use as concrete curing blanket shall be 4 mils thick, white opaque polyethylene film impregnated or extruded into one side of the burlap. Burlap shall weigh not less than 9 ounces per square yard. The loss of moisture, when determined in accordance with the requirements of ASTM C 156, shall not exceed 0.055 gram per square centimeter of surface.

8. Curing mats for use in Curing Method 6 as specified herein, shall be heavy shag rugs or carpets or cotton mats quilted at 4 inches on center. Curing mats shall weigh a minimum of 12 ounces per square yard when dry.

9. Evaporation retardant shall be a material such as Confirm as manufactured by Master Builders; Eucobar as manufactured by Euclid Chemical Company; or equal.

2.03 VAPOR RETARDER

A. Vapor Retarder: ASTM E 1745, Class A, not less than, 15 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

   1. Available Products: Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to the following:

      a. "VaporBlock VB15" by Viaflex, Inc.

      b. "Griffolyn 15 Mil" by Reef Industries, Inc.

      c. "Stego Wrap 15-Mil" by Stego Industries, LLC.

B. Minimum of 6-inch- thick crushed drain rock layer underneath the vapor retarder meeting the gradation requirements of coarse aggregate No. 6 per ASTM C33. A representative sample of the material to be used shall be provided to the Geotechnical Engineer a minimum of 10 business days before this material is imported to the project site.

C. Sealant tapes, adhesives, and other accessory materials for vapor retarder membranes shall be types recommended by membrane Manufacturer for areas and materials to be sealed.

2.04 NONWATERSTOP JOINT MATERIALS

A. Materials for nonwaterstop joints in concrete shall conform to the following requirements:

1. Preformed joint filler shall be a nonextruding, resilient, bituminous type conforming to the requirements of ASTM D 1751.

2. Elastomeric joint sealer shall conform to the requirements of Section 03290, Joints in Concrete.

3. Mastic joint sealer shall be a material that does not contain evaporating solvents; that will tenaciously adhere to concrete surfaces; that will remain permanently resilient and pliable; that will not be affected by continuous presence of water and will not in any way contaminate potable water; and that will effectively seal the joints against moisture infiltration even when the joints are subject to movement due to expansion and contraction. The sealer shall be composed of special asphalts or similar materials blended with lubricating and plasticizing agents to form a tough, durable mastic substance containing no volatile oils or lubricants and shall be capable of meeting the test requirements set forth hereinafter, if testing is required by the Engineer.

2.05 MISCELLANEOUS MATERIALS

A. Dampproofing agent shall be an asphalt emulsion, such as:

1. Hydroxide 600 by Sonneborn;

2. Damp-proofing Asphalt Coating by Euclid Chemical Company;

3. Sealmastic by W. R. Meadows, Inc.,

4. or equal.

B. Bonding agents shall be epoxy adhesives conforming to the following products for the applications indicated:

1. For bonding freshly-mixed, plastic concrete to hardened concrete:

   a. Sikadur 32 Hi Mod Epoxy Adhesive, as manufactured by Sika Corporation;

   b. Concresive Liquid (LPL), as manufactured by Master Builders;

   c. BurkEpoxy MV as manufactured by The Burke Company;

   d. or equal.

2. For bonding hardened concrete or masonry to steel:

   a. Sikadur 31 Hi Mod Gel as manufactured by Sika Corporation;

   b. BurkEpoxy NS as manufactured by The Burke Company;

   c. Concresive Paste (LPL) as manufactured by Master Builders;

   d. or equal.

2.06 CONCRETE DESIGN REQUIREMENTS

A. General: Concrete shall be composed of cement, admixtures, aggregates and water, each of the qualities indicated. The exact proportions in which these materials are to be used for different parts of the work shall be determined during the trial batch. In general, the mix shall be designed to produce a concrete capable of being deposited so as to obtain maximum density and minimum

shrinkage and, where deposited in forms, to have good consolidation properties and maximum smoothness of surface. In mix designs, the percentage of sand of the total weight of fine and coarse aggregate shall not exceed 41 for hydraulic structures or 50 for all other structures, unless noted otherwise. The aggregate gradations shall be formulated to provide fresh concrete that will not promote rock pockets around reinforcing steel or embedded items. The proportions shall be changed whenever necessary or desirable to meet the required results at no additional cost to the City. All changes shall be subject to review by the Engineer.

B. Water-Cement Ratio and Compressive Strength: The minimum compressive strength and cement content of concrete shall be not less than that in the following tabulation.

Type of Work	Min. 28-Day Compr Strength (psi)	Max. Size Aggregate (in)	Min. Cement Per Cubic Yard (lbs)	Max. W/C Ratio (by weight)
Structural Concrete:				
Walls, floor slabs, footings and all other concrete items not specified elsewhere	4,000	1	564	0.45
CIDH Piers	3,000	3/8	470	0.50
Other Concretes:				
Sitework concrete	3,000	1	470	0.50
Lean concrete	2,000	1-1/2	376	0.60

Note: The Contractor is cautioned that the limiting parameters above are not a mix design. Additional cement or water reducing agent may be required to achieve workability demanded by the Contractor's construction methods and aggregates. The Contractor is responsible for any costs associated with providing concrete with the required workability.

C. Adjustments to Mix Design: The mixes used shall be changed whenever such change is necessary or desirable to secure the required strength, density, workability, and surface finish and the Contractor shall be entitled to no additional compensation because of such changes.

2.07 CONSISTENCY

A. The quantity of water entering into a batch of concrete shall be just sufficient, with a normal mixing period, to produce a concrete which can be worked properly into place without segregation, and which can be compacted by the vibratory methods indicated to give the desired density, impermeability and smoothness of surface. The quantity of water shall be changed as necessary, with variations in the nature or moisture content of the aggregates, to maintain uniform production of a desired consistency. Do not exceed specified water-cement ratio. The consistency of the concrete in successive batches shall be determined by slump tests in accordance with ASTM C 143. The slumps shall be as follows:

Part of Work	Slump (in)

All concrete, unless noted otherwise	3 inches ± 1 inch
With high range water reducer added	6 inches ± 2 inches
Pea gravel mix	7 inches ± 2 inches
Ductbanks	5 inches ± 1 inch

2.08 TRIAL BATCH AND LABORATORY TESTS

A. Before placing any concrete, a testing laboratory designated by the City shall prepare a trial batch of each class of structural concrete, based on the preliminary concrete mixes submitted by the Contractor. During the trial batch the aggregate proportions may be adjusted by the testing laboratory using the two coarse aggregate size ranges to obtain the required properties. If one size range produces an acceptable mix, a second size range need not be used. Such adjustments shall be considered refinements to the mix design and shall not be the basis for extra compensation to the Contractor. All concrete shall conform to the requirements of this section, whether the aggregate proportions are from the Contractor's preliminary mix design, or whether the proportions have been adjusted during the trial batch process. The trial batch shall be prepared using the aggregates, cement and admixture proposed for the project. The trial batch materials shall be of a quantity such that the testing laboratory can obtain 3 drying shrinkage, and six compression test specimens from each batch. The cost of not more than three laboratory trial batch tests for each indicated concrete strength will be borne by the City but the Contractor shall furnish and deliver the materials in steel drums at no cost. Any additional trial batch testing required shall be performed by the Contractor at no additional cost to the City.

B. The determination of compressive strength will be made by testing 6-inch diameter by 12-inch high cylinders; made, cured and tested in accordance with ASTM C 192 and ASTM C 39. Three compression test cylinders will be tested at 7 days and three at 28 days. The average compressive strength for the three cylinders tested at 28 days for any given trial batch shall not be less than 125 percent of the specified compressive strength.

C. A sieve analysis of the combined aggregate for each trial batch shall be performed according to the requirements of ASTM C 136. Values shall be given for percent passing each sieve.

2.09 SHRINKAGE LIMITATION

A. The maximum concrete shrinkage for specimens cast in the laboratory from the trial batch, as measured at 21 day drying age or at 28 day drying age shall be 0.036 percent or 0.042 percent, respectively. Use a mix design for construction that has first met the trial batch shrinkage requirements. Shrinkage limitations apply only to structural concrete.

B. The maximum concrete shrinkage for specimens cast in the field shall not exceed the trial batch maximum shrinkage requirement by more than 25 percent.

C. If the required shrinkage limitation is not met during construction, take any or all of the following actions, at no additional cost to the City, for securing the shrinkage requirements. These actions may include changing the source or aggregates, cement and/or admixtures; reducing water content; washing of aggregate to reduce fines; increasing the number of construction joints; modifying the curing requirements; or other actions designed to minimize shrinkage or the effects of shrinkage.

2.10 MEASUREMENT OF CEMENT AND AGGREGATE

A. The amount of cement and of each separate size of aggregate entering into each batch of concrete shall be determined by direct weighing equipment acceptable to the Engineer.

B. Weighing Tolerances:

Material	Percent of Total Weight of Batch
Cement	+/- 1
Aggregates	+/- 3
Admixtures	+/- 3

2.11 MEASUREMENT OF WATER

A. The quantity of water entering the mixer shall be measured by a suitable water meter or other measuring device of a type acceptable to the Engineer and capable of measuring the water in variable amounts within a tolerance of one percent. The water feed control mechanism shall be capable of being locked in position so as to deliver constantly any specified amount of water to each batch of concrete. A positive quick-acting valve shall be used for a cut-off in the water line to the mixer. The operating mechanism must be such that leakage will not occur when the valves are closed.

2.12 READY-MIXED CONCRETE

A. At the Contractor's option, ready-mixed concrete may be used meeting the requirements as to materials, batching, mixing, transporting, and placing as indicated herein and in accordance with ASTM C 94, including the following supplementary requirements.

B. Ready-mixed concrete, as defined by ASTM C 94, shall be proportioned by mass at the concrete batch plant, mixed, and transported to the job site. Volumetric batching and job site mixing shall not be allowed. Ready-mixed concrete shall be delivered to the site of the work, and discharge shall be completed within one hour after the addition of the cement to the aggregates or before the drum has been revolved 250 revolutions, whichever is first.

C. Truck mixers shall be equipped with electrically-actuated counters by which the number of revolutions of the drum or blades may be readily verified. The counter shall be of the resettable, recording type, and shall be mounted in the driver's cab. The counters shall be actuated at the time of starting mixers at mixing speeds.

D. Each batch of concrete shall be mixed in a truck mixer for not less than 70 revolutions of the drum or blades at the rate of rotation designated by the Manufacturer of equipment. Additional mixing, if any, shall be at the speed designated by the Manufacturer of the equipment as agitating speed. All materials including mixing water shall be in the mixer drum before actuating the revolution counter for determining the number of revolutions of mixing.

E. Truck mixers and their operation shall be such that the concrete throughout the mixed batch as discharged is within acceptable limits of uniformity with respect to consistency, mix, and grading. If slump tests taken at approximately the 1/4 and 3/4 points of the load during discharge give slumps differing by more than one inch when the specified slump is 3 inches or less, or if they differ by more than 2 inches when the specified slump is more than 3 inches, the mixer shall not be used on

the work unless the causing condition is corrected and satisfactory performance is verified by additional slump tests. All mechanical details of the mixer, such as water measuring and discharge apparatus, condition of the blades, speed of rotation, general mechanical condition of the unit, and clearance of the drum, shall be checked before a further attempt to use the unit will be permitted.

F. Each batch of ready-mixed concrete delivered at the job site shall be accompanied by a delivery ticket furnished to the Engineer in accordance with the paragraph in Part 1 entitled "Delivery Tickets."

G. The use of nonagitating equipment for transporting ready-mixed concrete will not be permitted. Combination truck and trailer equipment for transporting ready-mixed concrete will not be permitted. The quality and quantity of materials used in ready-mixed concrete and in batch aggregates shall be subject to continuous inspection at the batching plant by the Engineer.

PART 3 - EXECUTION

3.01 PROPORTIONING AND MIXING

A. Proportioning: Proportioning of the concrete mix shall conform to the requirements of Chapter 3 "Proportioning" of ACI 301.

B. Mixing: Mixing of concrete shall conform to the requirements of Chapter 7 of said ACI 301 Specifications.

C. Slump: Maximum slumps shall be as indicated herein.

D. Retempering: Retempering of concrete or mortar which has partially hardened shall not be permitted.

3.02 PREPARATION OF SURFACES FOR CONCRETING

A. General: Earth surfaces shall be thoroughly wetted by sprinkling, prior to the placing of any concrete, and these surfaces shall be kept moist by frequent sprinkling up to the time of placing concrete thereon. The surface shall be free from standing water, mud, and debris at the time of placing concrete.

B. Joints in Concrete: Concrete surfaces upon or against which concrete is to be placed, where the placement of the concrete has been stopped or interrupted so that, as determined by the Engineer, the new concrete cannot be incorporated integrally with that previously placed, are defined as construction joints. The surfaces of horizontal joints shall be given a compacted, roughened surface for good bond. Except where the Drawings call for joint surfaces to be coated, the joint surfaces shall be cleaned of all laitance, loose or defective concrete, foreign material, and roughened to a minimum 1/4-inch amplitude. Such cleaning and roughening shall be accomplished by hydro blasting or sandblasting (exposing aggregate) followed by thorough washing. All pools of water shall be removed from the surface of construction joints before the new concrete is placed.

C. After the surfaces have been prepared all approximately horizontal construction joints shall be covered with a 6-inch lift of a rich pea gravel mix, as indicated above. The mix shall be placed and spread uniformly. Wall concrete shall follow immediately and shall be placed upon the fresh pea gravel mix.

D. Placing Interruptions: When placing of concrete is to be interrupted long enough for the concrete to take a set, the working face shall be given a shape by the use of forms or other means, that will secure proper union with subsequent work, provided that construction joints shall be made only where acceptable to the Engineer.

E. Embedded Items: No concrete shall be placed until all form work, installation of parts to be embedded, reinforcement steel, and preparation of surfaces involved in the placing have been completed and accepted by the Engineer at least 4 hours before placement of concrete. All surfaces of forms and embedded items that have become encrusted with dried grout from concrete previously placed shall be cleaned of all such grout before the surrounding or adjacent concrete is placed.

F. All inserts or other embedded items shall conform to the requirements herein.

G. All reinforcement, anchor bolts, sleeves, inserts, and similar items shall be set and secured in the forms where shown or by Shop Drawings and shall be acceptable to the Engineer before any concrete is placed. Accuracy of placement is the responsibility of the Contractor.

H. Casting New Concrete Against Old: Where concrete is to be cast against old concrete (any concrete which is greater than 60 days of age), the surface of the old concrete shall be thoroughly cleaned and roughened by hydro-blasting or sandblasting (exposing aggregate). The joint surface shall be coated with an epoxy bonding agent unless indicated otherwise by the Engineer.

I. No concrete shall be placed in any structure until all water entering the space to be filled with concrete has been properly cut off or has been diverted by pipes, or other means, and of the forms, clear of the work. No concrete shall be deposited underwater nor shall the Contractor allow still water to rise on any concrete until the concrete has attained its initial set. Water shall not be permitted to flow over the surface of any concrete in such manner and at such velocity as will injure the surface finish of the concrete. Pumping or other necessary dewatering operations for removing ground water, if required, will be subject to the review of the Engineer.

J. Corrosion Protection: Pipe, conduit, dowels, and other ferrous items required to be embedded in concrete construction shall be so positioned and supported prior to placement of concrete that there will be a minimum of 2 inches clearance between said items and any part of the concrete reinforcement. Securing such items in position by wiring or welding them to the reinforcement will not be permitted.

K. Openings for pipes, inserts for pipe hangers and brackets, and the setting of anchors shall, where practicable, be provided for during the placing of concrete.

L. Anchor bolts shall be accurately set, and shall be maintained in position by templates while being embedded in concrete.

M. Cleaning: The surfaces of all metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar, and other foreign substances immediately before the concrete is placed.

3.03 VAPOR RETARDERS

A. Vapor Retarder Membrane: A vapor retarder membrane shall be installed under all on-grade building floor slabs of occupiable (non-hydraulic) structures, and at any other locations designated in the Drawings.

1. Vapor Retarder: Place, protect, and repair vapor-retarder sheets according to ASTM E 1643 and Manufacturer's written instructions.

2. Vapor retarder membrane shall be installed over a 6-inch-thick crushed drain rock layer within perimeter of foundation line, moistened, and compacted with mechanical equipment to elevation tolerances of plus 0 inch or minus 1/4 inch. Seams shall be lapped and sealed with accepted tape or adhesive as indicated in the standard.

3.04 HANDLING, TRANSPORTING, AND PLACING

A. General: Placing of concrete shall conform to the applicable requirements of Chapter 8 of ACI 301 and the requirements of this section. No aluminum materials shall be used in conveying any concrete.

B. Nonconforming Work or Materials: Concrete which upon or before placing is found not to conform to the requirements herein shall be rejected and immediately removed from the work. Concrete which is not placed in accordance with these Specifications, or which is of inferior quality, shall be removed and replaced at no additional expense to the City.

C. Unauthorized Placement: No concrete shall be placed except in the presence of duly authorized representative of the Engineer. Notify the Engineer in writing at least 24 hours in advance of placement of any concrete.

D. Placement in Wall Forms: Concrete shall not be dropped through reinforcement steel or into any deep form, nor shall concrete be placed in any form in such a manner as to leave accumulation of mortar on the form surfaces above the placed concrete. In such cases, some means such as the use of hoppers and, if necessary, vertical ducts of canvas, rubber, or metal shall be used for placing concrete in the forms in a manner that it may reach the place of final deposit without separation. In no case shall the free fall of concrete exceed 4 feet below the ends of ducts, chutes, or buggies. Concrete shall be uniformly distributed during the process of depositing and in no case after depositing shall any portion be displaced in the forms more than 6 feet in horizontal direction. Concrete in forms shall be deposited in uniform horizontal layers not deeper than 2 feet; and care shall be taken to avoid inclined layers or inclined construction joints except where such are required for sloping members. Each layer shall be placed while the previous layer is still soft. The rate of placing concrete in forms shall not exceed 5 feet of vertical rise per hour. Sufficient illumination shall be provided in the interior of all forms so that the concrete at the places of deposit is visible from the deck or runway.

E. Casting New Concrete Against Old: An epoxy adhesive bonding agent shall be applied to the old surfaces according to the Manufacturer's written recommendations. This provision shall not apply to joints where waterstop is installed: see Section 03290, Joints in Concrete.

F. Conveyor Belts and Chutes: All ends of chutes, hopper gates, and all other points of concrete discharge throughout the Contractor's conveying, hoisting and placing system shall be so designed and arranged that concrete passing from them will not fall separated into whatever receptacle immediately receives it. Conveyor belts, if used, shall be of a type acceptable to the Engineer. Chutes longer than 50 feet will not be permitted. Minimum slopes of chutes shall be such that concrete of the indicated consistency will readily flow in them. If a conveyor belt is used, it shall be wiped clean by a device operated in such a manner that none of the mortar adhering to the belt will be wasted. All conveyor belts and chutes shall be covered.

G. Placement in Slabs: Concrete placed in sloping slabs shall proceed uniformly from the bottom of the slab to the top, for the full width of the placement. As the work progresses, the concrete shall

be vibrated and carefully worked around the slab reinforcement, and the surface of the slab shall be screeded in an up-slope direction.

H. Temperature of Concrete: The temperature of concrete when it is being placed shall be not more than 90 degrees F nor less than 55 degrees F for sections less than 12 inches thick nor less than 50 degrees for all other sections. Concrete ingredients shall not be heated to a temperature higher than that necessary to keep the temperature of the mixed concrete, as placed, from falling below the required minimum temperature. The time between the introduction of the cement to the aggregates and discharge shall not exceed 45 minutes. If concrete is placed when the weather is such that the temperature of the concrete would exceed 90 degrees F, the Contractor shall employ effective means, such as precooling of aggregates and mixing water using ice or placing at night, as necessary to maintain the temperature of the concrete, as it is placed, below 90 degrees F. The Contractor shall be entitled to no additional compensation on account of the foregoing requirements.

I. Cold Weather Placement:

1. Placement of concrete shall conform to ACI 306.1 Standard Specification for Cold Weather Concreting, and the following.
2. Remove all snow, ice and frost from the surfaces, including reinforcement, against which concrete is to be placed. Before beginning concrete placement, thaw the subgrade to a minimum depth of 6 inches. All reinforcement and embedded items shall be warmed to above 32 degrees F prior to concrete placement.
3. Maintain the concrete temperature above 50 degrees F for at least 3 days after placement.

J. Hot Weather Placement:

1. Placement of concrete shall conform to ACI 305R Hot Weather Concreting, and the following.
2. Only set retarding admixture shall be used in concrete when air temperature is expected to be consistently over 80 degrees F.
3. The maximum temperature of concrete shall not exceed 90 degrees F immediately before placement.
4. From the initial placement to the curing state, concrete shall be protected from the adverse effect of high temperature, low humidity, and wind.

3.05 PUMPING OF CONCRETE

A. General: If the pumped concrete does not produce satisfactory end results, discontinue the pumping operation and proceed with the placing of concrete using conventional methods.

B. Pumping Equipment: The pumping equipment shall have two cylinders and be designed to operate with one cylinder only in case the other one is not functioning. In lieu of this requirement, the Contractor may have a standby pump on the site during pumping.

C. The minimum diameter of the hose conduits shall be in accordance with ACI 304.2R.

D. Pumping equipment and hoses conduits that are not functioning properly, shall be replaced.

E. Aluminum conduits for conveying the concrete shall not be permitted.

F. Field Control: Concrete samples for slump, air content, and test cylinders will be taken at the discharge end of the line.

3.06 ORDER OF PLACING CONCRETE

A. The order of placing concrete in all parts of the work shall be acceptable to the Engineer. In order to minimize the effects of shrinkage, the concrete shall be placed in units as bounded by construction joints indicated. The placing of units shall be done by placing alternate units in a manner such that each unit placed shall have cured at least 7 days for hydraulic structures and 3 days for all other structures before the contiguous unit or units are placed, except that the corner sections of vertical walls shall not be placed until the two adjacent wall panels have cured at least 14 days for hydraulic structures and 7 days for all other structures.

B. Alternative or substitute methods of placing concrete for hydraulic structures shall not be accepted, except as follows:

1. Floor slabs: The 7 day curing time required between placement of adjacent slabs may be reduced to 5 days only after placement of at least 50 percent of the floor slabs and if the drying shrinkage tests have complied with the field cast specimen shrinkage limitations and if in the opinion of the Engineer no detrimental cracking has occurred. This procedure shall not take precedence over the requirements for removal of forms.

2. Roof slabs: The 7 day curing time required between placement of adjacent slabs may be reduced to 5 days only after placement of at least 20 percent of the roof slabs and if the drying shrinkage tests have complied with the field cast specimen shrinkage limitations and if in the opinion of the Engineer no detrimental cracking has occurred. This procedure shall not take precedence over the requirements for removal of forms.

C. The surface of the concrete shall be level whenever a run of concrete is stopped. To ensure a level, straight joint on the exposed surface of walls, a wood strip at least 3/4-inch thick shall be tacked to the forms on these surfaces. The concrete shall be carried about 1/2 inch above the underside of the strip. About one hour after the concrete is placed, the strip shall be removed and any irregularities in the edge formed by the strip shall be leveled with a trowel and all laitance shall be removed.

3.07 TAMPING AND VIBRATING

A. As concrete is placed in the forms or in excavations, it shall be thoroughly settled and compacted, throughout the entire depth of the layer which is being consolidated, into a dense, homogeneous mass, filling all corners and angles, thoroughly embedding the reinforcement, eliminating rock pockets, and bringing only a slight excess of water to the exposed surface of concrete during placement. Vibrators shall be Group 3 (per ACI 309) high speed power vibrators (8,000 to 12,000 rpm) of an immersion type in sufficient number and with (at least one) standby units as required. Group 2 vibrators may be used only at specific locations when accepted by the Engineer.

B. Care shall be used in placing concrete around waterstops. The concrete shall be carefully worked by rodding and vibrating to make sure that all air and rock pockets have been eliminated. Where flat-strip type waterstops are placed horizontally, the concrete shall be worked under the waterstops by hand, making sure that all air and rock pockets have been eliminated. Concrete surrounding the waterstops shall be given additional vibration, over and above that used for adjacent concrete placement to assure complete embedment of the waterstops in the concrete.

C. Concrete in walls shall be internally vibrated and at the same time rammed, stirred, or worked with suitable appliances, tamping bars, shovels, or forked tools until it completely fills the forms or

excavations and closes snugly against all surfaces. Subsequent layers of concrete shall not be placed until the layers previously placed have been worked thoroughly as specified. Vibrators shall be used in sufficient numbers, with standby units as indicated, to accomplish the required results within 15 minutes after concrete of the prescribed consistency is placed in the forms. The vibrating head shall be kept from contact with the surfaces of the forms. Care shall be taken not to vibrate concrete excessively or to work it in any manner that causes segregation of its constituents.

3.08 FINISHING CONCRETE SURFACES

A. General: Surfaces shall be free from fins, bulges, ridges, offsets, honeycombing, or roughness of any kind, and shall present a finished, smooth, continuous hard surface. Allowable deviations from plumb or level and from the alignment, profiles, and dimensions indicated are defined as tolerances and are given in Part 1, above. These tolerances are to be distinguished from irregularities in finish as described herein. Aluminum finishing tools shall not be used.

B. Formed Surfaces: No treatment is required after form removal except for curing, repair of defective concrete, and treatment of surface defects. Where architectural finish is required, it shall be as indicated.

1. Surface holes larger than 1/2 inch in diameter or deeper than 1/4 inch are defined as surface defects in basins and exposed walls.

C. Unformed Surfaces: After proper and adequate vibration and tamping, all unformed top surfaces of slabs, floors, walls, and curbs shall be brought to a uniform surface with suitable tools. Immediately after the concrete has been screeded, it shall be treated with a liquid evaporation retardant. The retardant shall be used again after each work operation as necessary to prevent drying shrinkage cracks. The classes of finish for unformed concrete surfaces are designated and defined as follows:

1. Finish U1: Sufficient leveling and screeding to produce an even, uniform surface with surface irregularities not to exceed 3/8 inch. No further special finish is required.

2. Finish U2: After sufficient stiffening of the screeded concrete, surfaces shall be float finished with wood or metal floats or with a finishing machine using float blades. Excessive floating of surfaces while the concrete is plastic and dusting of dry cement and sand on the concrete surface to absorb excess moisture will not be permitted. Floating shall be the minimum necessary to produce a surface that is free from screed marks and is uniform in texture. Surface irregularities shall not exceed 1/4 inch. Joints and edges shall be tooled where indicated or as determined by the Engineer.

3. Finish U3: After the floated surface (as indicated for Finish U2) has hardened sufficiently to prevent excess of fine material from being drawn to the surface, steel troweling shall be performed with firm pressure such as will flatten the sandy texture of the floated surface and produce a dense, uniform surface free from blemishes, ripples, and trowel marks. The finish shall be smooth and free of all irregularities.

4. Finish U4: Steel trowel finish (as indicated for Finish U3) without local depressions or high points. In addition, the surface shall be given a light hairbroom finish with brooming perpendicular to drainage unless otherwise indicated. The resulting surface shall be rough enough to provide a nonskid finish.

D. Unformed surfaces shall be finished according to the following schedule:

UNIFORMED SURFACE FINISH SCHEDULE

Area	Finish
Grade slabs and foundations to be covered with concrete or fill material	U1
Floors to be covered with grouted tile or topping grout	U2
Slabs which are water bearing with slopes 10 percent and less	U3
Sloping slabs which are water bearing with slopes greater than 10 percent	U4
Slabs not water bearing	U4
Slabs to be covered with built-up roofing	U2
Interior slabs and floors to receive architectural finish	U3
Top surface of walls	U3

3.09 ARCHITECTURAL FINISH

A. General: Architectural finishes shall be required only where specifically called out on the Drawings. In all other cases, Paragraph 3.08, Finishing Concrete Surfaces, shall apply.

1. Removal of Forms: Leave forms in place as long as practical. Remove forms when concrete has reached a consistent age to maintain uniformity of curing conditions throughout the project.

2. Immediately after the forms have been stripped, the concrete surface shall be inspected and any pour joints, voids, rock pockets, or other defective areas shall be repaired and all form-tie holes filled as indicated herein.

3. Architectural finishes shall not be applied until the concrete surface has been repaired as required and the concrete has cured at least 14 days.

4. All architecturally treated concrete surfaces shall conform to the accepted mock-up samples required herein in texture, color, and quality. It shall be the Contractor's responsibility to maintain and protect the concrete finish.

B. Smooth Concrete Finish:

1. The concrete surface shall be wetted, and a grout shall be applied with a brush. The grout shall be made by mixing one part portland cement and one part of fine sand that will pass a No. 16 sieve with sufficient water to give it the consistency of thick paint. The cement used in said grout shall be 1/2 gray and 1/2 white portland cement, as determined by the Engineer. White portland cement shall be Atlas white, or equal. Color additive shall be added if necessary for color match. Calcium chloride in the amount of 5 percent by volume of the cement shall be used in the brush coat. The freshly applied grout shall be vigorously rubbed into the concrete surface with a wood float filling all small air holes. After all the surface grout has been removed with a steel trowel, the surface shall be allowed to dry and, when dry, shall be vigorously rubbed with burlap to remove completely all surface grout so that there is no visible paint-like film of grout on the concrete. The entire cleaning operation for any area shall be completed the day it is started, and no grout shall be left on

the surface overnight. Color of concrete and grout shall match the concrete it is to be applied to.

2. Cleaning operations for any given day shall be terminated at panel joints. It is essential that the various operations be carefully timed to secure the desired effect which is a light-colored concrete surface of uniform color and texture without any appearance of a paint or grout film.

3. In the event that improper manipulation results in an inferior finish, rub such inferior areas with Carborundum bricks.

4. Before beginning any of the final treatment on exposed surfaces, treat in a satisfactory manner a trial area of at least 200 square feet in some inconspicuous place selected by the Engineer and shall preserve said trial area undisturbed until the completion of the job.

C. Sandblasted Concrete Finish

1. Sandblasting shall be done in a safe manner acceptable to local authorities and per OSHA requirements. The sandblasting shall be a medium sandblast to remove laitance and to produce a uniform fine aggregate surface texture with approximately 1/32 to 1/16 inch of surface sandblasted off. Corners, patches, form panel joints, and soft spots shall be sandblasted with care.

2. Sandblasted Finish: Allow concrete to cure to sufficient strength that it will not be damaged by blasting, but not less than 7 days.

3. A mock-up sample panel shall be provided with sandblasted finish by the Contractor for acceptance by the Engineer prior to starting the sandblasting work. The sample panel shall include a corner, plugs, and joints. All other sandblasting shall be equal in finish to the accepted sample panel.

4. Sandblasting shall be performed on all vertical surfaces of concrete and those horizontal surfaces not designated for walks.

5. Protection against sandblasting shall be provided on all surfaces and materials not requiring sandblasting but within or adjacent to areas being sandblasted. After sandblasting, the concrete surfaces shall be washed with clean water and excess sand removed.

6. All main exterior surfaces of the main building concrete pilasters shall be sandblast finish per architectural drawings.

3.10 CURING AND DAMPPROOFING

A. General: All concrete shall be cured for not less than 10 days after placing, in accordance with the methods indicated herein for the different parts of the work, and described in detail in the following paragraphs:

Surface to Be Cured or Dampproofed	Method
UNSTRIPPED FORMS	1
Wall sections with forms removed	6
Construction joints between footings and walls, and between floor slab and columns	2
Encasement concrete and thrust blocks	3
All concrete surfaces not specifically provided for elsewhere in this Paragraph	4

Floor slabs on grade	5
Slabs not on grade	6

B. Method 1: Wooden forms shall be wetted immediately after concrete has been placed and shall be kept wet with water until removed. If steel forms are used the exposed concrete surfaces shall be kept continuously wet until the forms are removed. If forms are removed within 10 days of placing the concrete, curing shall be continued in accordance with Method 6, herein. Do not use curing compound on cast-in-place prestressed tank wall.

C. Method 2: The surface shall be covered with burlap mats which shall be kept wet with water for the duration of the curing period, until the concrete in the walls has been placed. No curing compound shall be applied to surfaces cured under Method 2.

D. Method 3: The surface shall be covered with moist earth not less than 4 hours, nor more than 24 hours, after the concrete is placed. Earthwork operations that may damage the concrete shall not begin until at least 7 days after placement of concrete.

E. Method 4: The surface shall be sprayed with a liquid curing compound.

1. It shall be applied in accordance with the Manufacturer's printed instructions at a maximum coverage rate of 200 square feet per gallon and in such a manner as to cover the surface with a uniform film which will seal thoroughly.

2. Where the curing compound method is used, care shall be exercised to avoid damage to the seal during the curing period. Should the seal be damaged or broken before the expiration of the curing period, the break shall be repaired immediately by the application of additional curing compound over the damaged portion.

3. Wherever curing compound may have been applied by mistake to surfaces against which concrete subsequently is to be placed and to which it is to adhere, said compound shall be entirely removed by wet sandblasting just prior to the placing of new concrete.

4. Where curing compound is indicated, it shall be applied as soon as the concrete has hardened enough to prevent marring on unformed surfaces, and within 2 hours after removal of forms from contact with formed surfaces. Repairs required to be made to formed surfaces shall be made within the said 2 hour period; provided, however, that any such repairs which cannot be made within the said 2 hour period shall be delayed until after the curing compound has been applied. When repairs are to be made to an area on which curing compound has been applied, the area involved shall first be wet-sandblasted to remove the curing compound, following which repairs shall be made.

5. At all locations where concrete is placed adjacent to a panel which has been coated with curing compound, the previously coated panel shall have curing compound reapplied to an area within 6 feet of the joint and to any other location where the curing membrane has been disturbed.

6. Prior to final acceptance of the work, all visible traces of curing compound shall be removed from all surfaces in such a manner that does not damage surface finish.

F. Method 5:

1. Until the concrete surface is covered with curing compound, the entire surface shall be kept damp by applying water using nozzles that atomize the flow so that the surface is not marred or washed. The concrete shall be given a coat of curing compound in accordance with Method 4, herein. Not less than 1 hour nor more than 4 hours after the coat of curing

compound has been applied, the surface shall be wetted with water delivered through a fog nozzle, and concrete-curing blankets shall be placed on the slabs. The curing blankets shall be polyethylene sheet, polyethylene-coated waterproof paper sheeting or polyethylene-coated burlap. The blankets shall be laid with the edges butted together and with the joints between strips sealed with 2-inch wide strips of sealing tape or with edges lapped not less than 3 inches and fastened together with a waterproof cement to form a continuous watertight joint.

2. The curing blankets shall be left in place during the 10 day curing period and shall not be removed until after concrete for adjacent work has been placed. Should the curing blankets become torn or otherwise ineffective, replace damaged sections. During the first 3 days of the curing period, no traffic of any nature and no depositing, temporary or otherwise, of any materials shall be permitted on the curing blankets. During the remainder of the curing period, foot traffic and temporary depositing of materials that impose light pressure will be permitted only on top of plywood sheets 5/8 inch minimum thickness, laid over the curing blanket. Add water under the curing blanket as often as necessary to maintain damp concrete surfaces at all times.

G. Method 6: This method applies to both walls and slabs.

1. The concrete shall be kept continuously wet by the application of water for a minimum period of at least 10 consecutive days beginning immediately after the concrete has reached final set or forms have been removed.

2. Until the concrete surface is covered with the curing medium, the entire surface shall be kept damp by applying water using nozzles that atomize the flow so that the surface is not marred or washed.

3. Heavy curing mats shall be used as a curing medium to retain the moisture during the curing period. The curing medium shall be weighted or otherwise held in place to prevent being dislodged by wind or any other causes and to be substantially in contact with the concrete surface. All edges shall be continuously held in place.

4. The curing blankets and concrete shall be kept continuously wet by the use of sprinklers or other means both during and after normal working hours.

5. Immediately after the application of water has terminated at the end of the curing period, the curing medium shall be removed, any dry spots shall be rewetted, and curing compound shall be immediately applied in accordance with Method 4, herein except that curing compound shall not be used on the cast-in-place prestressed tank wall.

6. Dispose of excess water from the curing operation to avoid damage to the work.

H. Dampproofing: The exterior surface of all buried roof slabs shall be dampproofed as follows:

1. Immediately after completion of curing the surface shall be sprayed with a dampproofing agent consisting of an asphalt emulsion. Application shall be in two coats. The first coat shall be diluted to 1/2 strength by the addition of water and shall be sprayed on so as to provide a maximum coverage rate of 100 square feet per gallon of dilute solution. The second coat shall consist of an application of the required material, undiluted, and shall be sprayed on so as to provide a maximum coverage rate of 100 square feet per gallon. Dampproofing material shall be as indicated herein.

2. As soon as the asphalt emulsion, has taken an initial set, the entire area thus coated shall be coated with whitewash. Any formula for mixing the whitewash may be used which produces a uniformly coated white surface and which so remains until placing of the

backfill. Should the whitewash fail to remain on the surface until the backfill is placed, apply additional whitewash.

3.11 PROTECTION

A. Protect all concrete against injury until final acceptance by the City.

B. Fresh concrete shall be protected from damage due to rain, hail, sleet, or snow. Provide such protection while the concrete is still plastic and whenever such precipitation is imminent or occurring.

3.12 CURING IN COLD WEATHER

A. Water curing of concrete may be reduced to 6 days during periods when the mean daily temperature in the vicinity of the work site is less than 40 degrees F; provided that, during the prescribed period of water curing, when temperatures are such that concrete surfaces may freeze, water curing shall be temporarily discontinued.

B. Concrete cured by an application of curing compound will require no additional protection from freezing if the protection at 50 degrees F for 72 hours is obtained by means of approved insulation in contact with the forms or concrete surfaces; otherwise the concrete shall be protected against freezing temperatures for 72 hours immediately following 72 hours protection at 50 degrees F. Concrete cured by water curing shall be protected against freezing temperatures for 3 days immediately following the 72 hours of protection at 50 degrees F.

C. Discontinuance of protection against freezing temperatures shall be such that the drop in temperature of any portion of the concrete will be gradual and will not exceed 40 degrees F in 24 hours. In the spring, when the mean daily temperature rises above 40 degrees F for more than 3 successive days, the specified 72-hour protection at a temperature not lower than 50 degrees F may be discontinued for as long as the mean daily temperature remains above 40 degrees F; provided, that the concrete shall be protected against freezing temperatures for not less than 48 hours after placement.

D. Where artificial heat is employed, special care shall be taken to prevent the concrete from drying. Use of unvented heaters will be permitted only when unformed surfaces of concrete adjacent to the heaters are protected for the first 24 hours from an excessive carbon dioxide atmosphere by application of curing compound; provided, that the use of curing compound for such surfaces is otherwise permitted by these Specifications.

3.13 CIDH PIER FOUNDATIONS

A. Construction Criteria

1. Provide equipment for checking the dimensions and alignment of each shaft excavation. Determine dimensions and alignment jointly with the contractor and engineer. Measure final shaft depths with appropriate weighted tape measure or other approved method after cleaning.
2. Provide and install monolithically cast-in-place concrete drilled shaft foundation to the sizes indicated.
3. Provide and install straight cylindrical shaft foundation of the type indicated.
4. Tolerances:

a. Maximum variation of the center of any shaft foundation from the required location: 2 inches, measured at the ground surface.

b. Bottom Diameter: Minus zero, plus 6 inches, measured in any direction.

c. Maximum variation from plumb: 1:40.

d. Maximum bottom level: Plus or minus 2 inches.

B. Excavation

1. Accomplish excavation of shaft foundations by standard excavation methods including, but not limited to, conventional augers fitted with soil and/or rock teeth, or under-reaming tools attached to drilling equipment of adequate size, power, torque and down thrust necessary for the work.

2. Perform excavation through whatever materials that are encountered to the dimensions, depths and applicable ACI 336 tolerances.

3. Protect excavated walls with temporary watertight steel casings of sufficient length to prevent water intrusion, cave-ins, displacement of surrounding earth, and injury to personnel and damage to construction operations.

4. Excavate shafts for drilled foundations to indicated elevations. Remove loose debris, materials and/or muck to make bottom surfaces level within ACI 336.1 tolerances.

5. Remove water from excavated shaft prior to concrete placement.

6. CIDH pier holes deeper than 7 feet shall be either temporarily cased during installation or be drilled using the slurry displacement method. The contractor shall prepare a submittal describing the equipment, procedures, and materials to be used for installation of the CIDH piers. This submittal shall be subject to review and approval by the Engineer of Record and the Geotechnical Engineer.

C. Steel Reinforcement

1. Comply with recommendations in the CRSI "Manual of Standard Practice" CRSI 10MSP for fabricating, placing and supporting reinforcement. Shop-fabricate steel reinforcement in accordance with ACI SP-66.

2. When practicable, deliver the reinforcement cage assembly to the jobsite as a complete unit ready for installation. Should it be necessary to make any additional connections and/or splices, provide as indicated on the approved shop drawings, at-grade level prior to lowering the complete assembly into the hole.

3. Clean reinforcement of loose rust, mill scale, earth and other foreign materials. Do not tack weld crossing reinforcing bars. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

4. Lower reinforcement steel into the hole in such a manner as to prevent damage to the walls of the excavation. Place, tie and/or clip cage symmetrically about the axis of the shaft. Use centering devices securely attached to the cage to clear the shaft walls and maintain the cage in place throughout the concrete placement operations.

5. Cooperate with other trades in setting of anchor bolts, inserts, and other embedded items. Where conflicts occur between reinforcing and embedded items, notify the Contracting Officer in order to reconcile conflicts before concrete placement. Position and support anchors and embedded items with appropriate accessories.

6. Use templates to set anchor bolts, leveling plates and other accessories required for structure erection. Provide blocking and/or holding devices to maintain required anchoring positions during final concrete placement.

D. Concrete Placement

1. Keep all equipment, including but not limited to, mixers, pumps, hoses, tools and screeds clean and free of set concrete throughout the placement operation.

2. Convey concrete from the mixer to place of deposit by best industry methods that prevents segregation and loss of material. Size and design the equipment for conveying concrete to ensure uniform, continuous placement of concrete.

3. Place concrete in accordance with ACI 318.

4. Place concrete in a continuous operation and without segregation into dry excavations whenever possible after inspection and written approval by the Contracting Officer. Use all practicable means to obtain a dry excavation before and during concrete placement. Casing or slurry displacement method shall be used for wet excavations.

5. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. When hot weather conditions exist that would impair quality and strength of placed concrete, comply with ACI 305R. Comply with ACI 306.1 for cold-weather protection.

6. A minimum of 50 percent of the base for each shaft is to be less than 1/2 inch of sediment at the time of concrete placement. Maximum depth of sediment or debris at any place on the base of the shaft is not to exceed 1-1/2 inches. Shaft cleanliness is to be determined by the engineer by visual inspection.

3.14 TREATMENT OF SURFACE DEFECTS

A. As soon as forms are removed, all exposed surfaces shall be carefully examined and any irregularities shall be immediately rubbed or ground in a satisfactory manner in order to secure a smooth, uniform, and continuous surface. Plastering or coating of surfaces to be smoothed will not be permitted. No repairs shall be made until after inspection by the Engineer. In no case will extensive patching of honeycombed concrete be permitted. Concrete containing minor voids, holes, honeycombing, or similar depression defects shall be repaired in accordance with the requirements of Paragraph 3.15, herewithin. Concrete containing extensive voids, holes, honeycombing, or similar depression defects, shall be completely removed and replaced. All repairs and replacements shall be promptly executed by the Contractor at no increased cost to the City.

B. Defective surfaces to be repaired shall be cut back from true line a minimum depth of 1/2 inch over the entire area. Feathered edges will not be permitted. Where chipping or cutting tools are not required in order to deepen the area properly, the surface shall be prepared for bonding by the removal of all laitance or soft material, and not less than 1/32 inch depth of the surface film from all hard portions, by means of an efficient sandblast. For exposed walls, the cement shall contain such a proportion of Atlas white portland cement as is required to make the color of the patch match the color of the surrounding concrete. Repair of defective surface shall be in accordance with the requirements of Paragraph 3.15, herewithin.

C. Holes left by tie-rod cones shall be reamed with suitable toothed reamers so as to leave the surfaces of the holes clean and rough. These holes then shall be repaired in an approved manner with dry-packed cement grout. Holes left by form-tying devices having a rectangular cross-section, and other imperfections having a depth greater than their least surface dimension, shall not be reamed but shall be repaired in an approved manner with dry packed cement grout.

D. All repairs shall be built up and shaped in such a manner that the completed work will conform to the requirements of this section, as applicable, using approved methods which will not disturb the bond, cause sagging, or cause horizontal fractures. Surfaces of said repairs shall receive the same kind and amount of curing treatment as required for the concrete in the repaired section.

E. Prior to filling any hydraulic structure with water, all cracks that may have developed on the water bearing surface of the members shall be "routed" as indicated and filled with sealant conforming to the requirements of Section 03290, Joints in Concrete. Prior to backfilling, faces of members in contact with fill, which are not covered with a waterproofing membrane, shall also have cracks repaired as specified herein. Repair of cracks shall be in accordance with the requirements of Paragraph 3.15, herewithin.

3.15 REPAIR OF DEFECTS

A. Do not repair defects until concrete has been inspected by the Structural Engineer of Record.

B. Repair surface defects that are smaller than 1 foot across in any direction and are less than 1/2 inch in depth by removing the honeycombed and other defective concrete down to sound concrete, make the edges perpendicular to the surface and at least 3/8-inch deep, thoroughly dampen the surface, work into the surface a bonding grout, fill the hole with mortar, match the finish on the adjacent concrete, and cure as specified.

C. Repair severe defects that are larger than surface defects but do not affect the structural integrity of the structure by removing the honeycombed and other defective concrete down to sound concrete, make the edges of the hole perpendicular to the surface, sand, grit or water blast the surface, coat the blasted surface with epoxy bonding compound, place non-shrink grout, match the finish on the adjacent concrete, and cure as specified.

D. If the defects affect the structural integrity of the structure or if patching does not satisfactorily restore the quality of the appearance to the surface, remove and replace all affected areas.

3.16 REPAIR OF CRACKS

A. Repair of cracks in concrete structures that are greater than 1/10-inch in width by cutting out a square edge and uniformly align joint 1/4-inch wide by 1/2-inch deep, prepare exposed surfaces of the joint, priming the joint, and applying polyurethane joint sealant.

B. If the crack affects the structural integrity or function of the element, remove and replace all affected areas.

3.17 CARE AND REPAIR OF CONCRETE

A. Protect all concrete against injury or damage from excessive heat, lack of moisture, over stress, or any other cause until final acceptance by the City. Particular care shall be taken to prevent the drying of concrete and to avoid roughening or otherwise damaging the surface. Any concrete found to be damaged, or which may have been originally defective, or which becomes defective at any time prior to the final acceptance of the completed work, or which departs from the established line or grade, or which, for any other reason, does not conform to the requirements of the Contract Documents, shall be satisfactorily repaired or removed and replaced with acceptable concrete at the Contractor's expense.

END OF SECTION

SECTION 03600

GROUT

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall provide all labor, materials, equipment and incidentals required and install grout complete as shown on the Drawings and as specified herein.

B. Perform all sampling and furnish all testing of materials and products by an independent testing laboratory acceptable to the Engineer but engaged by and at the expense of the Contractor.

1.02 RELATED WORK

A. The Work of the following Sections applies to the Work of this Section. Other Sections of the Specifications not referenced below, shall also apply to the extent required for proper performance of this Work.

1. Section 03100 Concrete Formwork
2. Section 03200 Reinforcement Steel
3. Section 03290 Joints in Concrete
4. Section 03300 Cast-in-place Concrete

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Commercial Standards

1. American Society for Testing and Materials (ASTM)

ASTM C33 Standard Specification for Concrete Aggregates

ASTM C150 Standard Specification for Portland Cement

ASTM C531 Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts and Monolithic Surfacings and Polymer Concretes

ASTM C579 Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings and Polymer Concretes

ASTM C827 Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures

ASTM C1077 Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation

ASTM C1107 Standard Specification for Packaged Dry, Hydraulic Cement Grout (Non-shrink)

ASTM D695 Standard Test Method for Compressive Properties of Rigid Plastics.

ASTM E329 Standard Specification For Agencies Engaged In The Testing and/or Inspection Of Materials Used In Construction

2. California Building Code (CBC)

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

1.04 SUBMITTALS

A. Submit, in accordance with Section 01300, shop drawings and product data showing materials of construction and details of surface preparation, mixing and installation for:

1. Commercially manufactured non-shrink cementitious grout. Include catalog cuts, technical data, storage requirements, product life, working time after mixing, temperature considerations, conformity to the specified ASTM standards, and Material Safety Data Sheet.

2. Commercially manufactured non-shrink epoxy grout. Include catalog cuts, technical data, storage requirements, product life, working time after mixing, temperature considerations, conformity to the specified ASTM standards, and Material Safety Data Sheet.

3. Cement grout. Include the type and brand of cement, the gradation of fine aggregate, product data on any proposed admixtures and the proposed grout mix.

4. Concrete grout. Include data as required for concrete as delineated in Section 03300.

B. Samples

1. Submit samples of commercially manufactured grout products when requested by the Engineer.

2. Submit samples of aggregates proposed for use in grout mixes when requested by the Engineer.

C. Laboratory Test Reports

1. For concrete grout, submit laboratory test data as required for concrete as delineated in Section 03300.

D. Certifications

1. Certify that commercially manufactured grout products and admixtures for cement grout and concrete grout are made for use in contact with potable water 30 days after installation (non-toxic and free of taste and odor).

2. Certify that the Contractor is not associated with the independent testing laboratory, nor does the Contractor or its officers have a beneficial interest in the laboratory.

E. Qualifications

1. Submit documentation that grout manufacturers have a minimum of at least 10 years experience in the production and use of the grouts proposed.

2. Independent Testing Laboratory

a. Name and address

b. Names and positions of principal officers and the name, position, and qualifications of the responsible registered professional engineer in charge.

c. Listing of technical services to be provided. Indicate external technical services to be provided by other organizations.

d. Names and qualifications of the supervising laboratory technicians.

e. Statement of conformance provided by evaluation authority defined in ASTM C1077. Provide report prepared by evaluation authority when requested by the Engineer.

f. Submit as required above for other organizations that will provide external technical services.

1.05 QUALITY ASSURANCE

A. Qualifications

1. Grout manufacturers shall have a minimum of 10 years experience in the production and use of the type of grout proposed.

2. Independent testing laboratory shall meet the requirements of ASTM E329 and ASTM C1077 and be acceptable to the Engineer. Laboratories affiliated with the Contractor or in which the Contractor or officers of the Contractor's organization have beneficial interest are not acceptable.

B. Pre-installation Meeting

1. At least ten working days before grouting, hold a pre-installation meeting to review the requirements for surface preparation, mixing, placing and curing procedures for each product proposed for use. Notify all parties involved with grouting, including the Engineer, of the meeting at least ten working days prior to its scheduled date.

C. Services of Manufacturer's Representative

1. Provide services of a field technician of the non-shrink grout manufacturer who has performed at least five projects of similar size and complexity during the last five years, to attend the pre-installation meeting, to be present for the initial installation of each type of non-shrink grout, and to correct installation problems.

D. Field Testing

1. All field testing and inspection services will be provided by the City. Assist in the sampling of materials and cooperate by allowing free access to the work and permitting the use of ladders, scaffolding, and such incidental equipment as may be required. Methods of testing will comply with the applicable ASTM Standards.

2. Field testing of concrete grout will be as specified for concrete in Section 03300.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the jobsite in original, unopened packages, clearly labeled with the manufacturer's name, product identification, batch numbers and printed instructions.

B. Store materials in full compliance with the manufacturer's recommendations. Limit total storage time from date of manufacture to date of installation to six months or the manufacturer's recommended storage time, whichever is less.

C. Remove immediately from the site material which becomes damp, contains lumps, or is hardened and replace with acceptable material at no additional cost to the City.

D. Deliver non-shrink cementitious grout as a pre-portioned blend in prepackaged mixes requiring only the addition of water.

E. Deliver non-shrink epoxy grout as a pre-proportioned, prepackaged, three component system requiring only mixing as directed by the manufacturer.

1.07 DEFINITIONS

A. Non-shrink Grout: A commercially manufactured product that does not shrink in either the plastic or hardened state, is dimensionally stable in the hardened state and bonds to a clean base plate.

PART 2 - PRODUCTS

2.01 GENERAL

A. The use of a manufacturer's name and product or catalog number is for the purpose of establishing the standard of quality desired.

B. Like materials shall be the products of one manufacturer or supplier in order to provide standardization of appearance.

2.02 MATERIALS

A. Non-shrink Cementitious Grout

1. Non-shrink cementitious grouts: Conform to ASTM C1107. Grouts shall be portland cement based, contain a pre-proportioned blend of selected aggregates and shrinkage compensating agents and require only the addition of water. Non-shrink cementitious grouts shall not contain expansive cement or metallic particles. The grouts shall exhibit no shrinkage when tested in conformity with ASTM C827.

    a. General purpose non-shrink cementitious grout: Conform to the standards stated above. SikaGrout 212 by Sika Corp.; Set Grout by BASF Building Systems; NS Grout by The Euclid Chemical Co.; Five Star Grout by Five Star Products, Inc., or equal.

    b. Flowable (Precision) non-shrink cementitious grout: Conform to the standards stated above. Masterflow 928 by BASF Building Systems; Hi Flow Grout by The Euclid Chemical Co.; SikaGrout 212 by Sika Corp.; Five Star Grout by Five Star Products, Inc., or equal.

B. Non-shrink Epoxy Grout

1. Non-shrink epoxy grout: Grout shall be pre-proportioned, prepackaged, three component, 100 percent solids system consisting of epoxy resin, hardener and blended aggregate. It shall have a compressive strength of 10,000 psi in 7 days when tested in conformity with ASTM C579 and have a maximum coefficient of thermal expansion of 30 x 10 6 in/in/degrees F when tested in conformity with ASTM C531. Masterflow 648 CP by BASF Building Systems; Five Star HP Epoxy Grout by Five Stars Products, Inc; Sikadur 42 Grout Pak by Sika Corp.; E3-G Epoxy Grout by the Euclid Chemical Co. or equal.

C. Cement Grout

1. A mixture of one part portland cement conforming to ASTM C150, Type I, II, or III and one to two parts sand conforming to ASTM C33 with sufficient water to place the grout. The water content shall be sufficient to impart workability to the grout but not to the degree that it will allow the grout to flow.

D. Concrete Grout

1. Conform to the requirements of Section 03300 except as specified herein. Proportion with Type II cement, coarse and fine aggregates, water, water reducing admixture and air entraining agent to produce a mix having an average strength of 3500 psi at 28 days (2500 psi nominal strength). Coarse aggregate size shall be 3/8-in maximum. Slump shall not exceed 5-in. Minimum cement content shall be 540 lbs per cubic yard and maximum water to cement ratio shall be 0.45.

E. Water

1. Potable water free of oil, acid, alkali, salts, chlorides (except those attributable to drinking water), organic matter, or other deleterious substances.

PART 3 - EXECUTION

3.01 PREPARATION

A. Place grout where indicated or specified over cured concrete which has attained its specified design strength unless otherwise approved by the Engineer.

B. Concrete surfaces to receive grout shall be clean and sound; free of ice, frost, dirt, dust, grease, oil, form release agent, laitance and paints and free of all loose material or foreign matter which may affect the bond or performance of the grout.

C. Roughen concrete surfaces by chipping, sandblasting, or other dry mechanical means to bond the grout to the concrete. Remove loose or broken concrete. Irregular voids or projecting coarse aggregate need not be removed if they are sound, free of laitance and firmly embedded into the parent concrete.

1. Air compressors used to clean surfaces in contact with grout shall be the oilless type or equipped with an oil trap in the airline to prevent oil from being blown onto the surface.

D. Remove all loose rust, oil or other deleterious substances which may affect the bond or performance of the grout from metal embedments or bottom of baseplates prior to the installation of the grout.

E. Wash concrete surfaces clean and then keep moist for at least 24 hours prior to the placement of non-shrink cementitious or cement grout. Saturation may be achieved by covering the concrete with saturated burlap bags, use of a soaker hose, or flooding the surface. Upon completion of the 24-hour period, remove visible water from the surface prior to grouting.

F. Non-shrink epoxy grouts do not require saturation of the concrete substrate. Do not wet concrete surfaces to receive non-shrink epoxy grout. Surfaces in contact with epoxy grout shall be completely dry before grouting.

G. Provide forms for grout. Line or coat forms with release agents recommended by the grout manufacturer. Provide forms anchored in place and shored to resist the forces imposed by the grout and its placement.

1. Forms for all grout other than concrete grout shall be designed to allow the formation of a hydraulic head and shall have chamfer strips built into forms.

H. Level and align the structural or equipment bearing plates in accordance with the structural requirements or the recommendations of the equipment manufacturer, as applicable.

I. Support equipment during alignment and installation of grout by shims, wedges, blocks or other approved means. The shims, wedges and blocking devices shall be prevented from bonding to the grout by bond breaking coatings and removed after grouting unless otherwise approved by the Engineer. Grout voids created by the removal of shims, wedges and blocks.

3.02 INSTALLATION GENERAL

A. Mix, apply and cure products in strict compliance with the manufacturer's recommendations and these specifications.

B. Provide staffing and equipment available for rapid and continuous mixing and placing. Keep all necessary tools and materials ready and close at hand.

C. Maintain temperatures of the base plate, supporting concrete, and grout between 40 and 90 degrees F during grouting and for at least 24 hours after placement, until grout compressive strength reaches 1000 psi or as recommended by the grout manufacturer, whichever is longer. Do not allow differential heating or cooling of baseplates and grout during the curing period.

D. Take special precautions for hot weather or cold weather grouting as recommended by the manufacturer when ambient temperatures and/or the temperature of the materials in contact with the grout are outside of the 40 to 90 degrees F range.

E. Install grout to preserve the isolation between the elements on either side of the joint where grout is placed in the vicinity of an expansion or control joint.

F. Reflect all existing underlying expansion, control and construction joints through the grout.

3.03 INSTALLATION - NON-SHRINK CEMENTITIOUS GROUTS AND CEMENT GROUTS

A. Mix in accordance with manufacturer's recommendations. Do not add cement, sand, pea gravel or admixtures without prior approval by the Engineer.

B. Do not mix by hand. Mix in a mortar mixer with moving blades. Pre-wet the mixer and empty excess water. Add pre-measured amount of water for mixing, followed by the grout. Begin with the minimum amount of water recommended by the manufacturer and then add the minimum additional water required to obtain workability. Do not exceed the manufacturer's maximum recommended water content.

C. Placements greater than 3-in in depth shall include the addition of clean, washed pea gravel to the grout mix when approved by the manufacturer. Comply with the manufacturer's recommendations for the size and amount of aggregate to be added.

D. Provide forms as specified in Paragraph 3.01G. Place grout into the designated areas and prevent segregation and entrapment of air. Do not vibrate grout to release air or to consolidate the material. Fill all spaces and provide full contact between the grout and adjoining surfaces. Provide grout holes and vent holes as necessary.

E. Place grout rapidly and continuously to avoid cold joints. Do not place grout in layers. Do not add additional water to the mix (retemper) after initial stiffening.

F. Just before the grout reaches its final set, cut back the grout to the substrate at a 45-degree angle from the lower edge of bearing plate unless otherwise ordered and approved by the Engineer. Finish this surface with a wood float or brush finish.

G. Begin curing immediately after form removal, cutback, and finishing. Keep grout moist and within its recommended placement temperature range for at least 24 hours after placement, until grout compressive strength reaches 1000 psi or as recommended by the manufacturer, whichever is longer. Saturate the grout surface by use of saturated burlap bags, soaker hoses or ponding. Provide sunshades. If drying winds inhibit the ability of a given curing method to keep grout moist, erect wind breaks until wind is no longer a problem or curing is finished.

3.04 INSTALLATION - NON-SHRINK EPOXY GROUTS

A. Mix in accordance with manufacturer’s recommendations. Mix full batches only, to maintain proper proportions of resin, hardener and aggregate. Do not vary the ratio of components or add solvent to change the consistency of the grout mix. Do not overmix. Do not entrain air bubbles by mixing too quickly.

B. Monitor ambient weather conditions and contact the grout manufacturer for special placement procedures to be used for temperatures below 60 or above 90 degrees F.

C. Place grout rapidly and continuously to avoid cold joints. Place grout in lifts in accordance with manufacturer’s recommendations.

D. Provide forms as specified in Paragraph 3.01G. Place grout into the designated areas and prevent entrapment of air. Fill all spaces and provide full contact between the grout and adjoining surfaces. Provide grout holes and vent holes as necessary.

E. Minimize "shoulder" length (extension of grout horizontally beyond base plate). In no case shall the shoulder length of the grout be greater than the grout thickness.

F. Finish grout by puddling to cover all aggregate and provide a smooth finish. Break bubbles and smooth the top surface of the grout in conformity with the manufacturer's recommendations.

G. Epoxy grouts are self curing and do not require the application of water. Maintain the formed grout within its recommended placement temperature range for at least 24 hours after placement, until grout compressive strength reaches 1000 psi or as recommended by the manufacturer, whichever is longer.

H. Provide grout control joints as indicated on the Drawings.

3.05 INSTALLATION - CONCRETE GROUT

A. Inspect slabs finished under Section 03300 and scheduled to receive concrete grout. Protect and keep the surface clean until placement of concrete grout.

B. Remove debris and clean the surface by sweeping and vacuuming of all dirt and other foreign materials. Pressure wash the surface. Do not flush debris into tank drain lines.

C. Saturate the concrete surface for at least 24 hours prior to placement of the concrete grout by use of saturated burlap bags, soaker hoses or ponding. Remove excess water just prior to placement of the concrete grout. Place a cement slurry immediately ahead of the concrete grout so that the slurry is moist when the grout is placed. Work the slurry over the surface with a broom until it is coated with approximately 1/16 to 1/8-in thick cement paste.

D. Place concrete grout to final grade using the scrapers of the installed mechanical equipment as a guide for surface elevation and to eliminate high and low spots. Unless specifically approved by the equipment manufacturer, mechanical scraper mechanisms powered by their motors shall not be used as a finishing machine or screed to push grout.

E. Provide grout control joints as indicated on the Drawings.

F. Steel trowel finish as specified in Section 03300. Cure the concrete grout as specified for cast-in-place concrete in Section 03300.

3.06 SCHEDULE

A. The following list indicates where the particular types of grout are to be used:

1. General purpose non-shrink cementitious grout: Use at all locations where non-shrink grout is indicated on the Drawings, except for base plates greater in area than 3-ft wide by 3-ft long.

2. Flowable (precision) non-shrink cementitious grout: Use under all base plates greater in area than 3-ft wide by 3-ft long. Use at all locations indicated on the Drawings to receive flowable non-shrink grout. Flowable (precision), non-shrink, cementitious grout may be substituted for general purpose non-shrink cementitious grout.

3. Non-shrink epoxy grout: Use at all locations specifically indicated on the Drawings to receive non-shrink epoxy grout.

4. Cement grout: Use where indicated on the Drawings.

5. Concrete grout: Use for concrete grout fill within liquid retaining structures and other locations where specifically indicated on the Drawings.

END OF SECTION

SECTION 05120

STRUCTURAL STEEL

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals, and install structural steel including bearing plates, columns, beams and miscellaneous shapes and plates required to erect the structural framing as shown on the Drawings and as specified herein.

B. All structural steel members shall be hot-dip galvanized steel unless otherwise noted.

1.02 RELATED WORK

A. Section 03600 Grout

B. Section 05500 Miscellaneous Metal

C. Section 09900 Painting and Coating

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Commercial Standards

1. American Institute of Steel Construction (AISC)

AISC 303	Code of Standard Practice for Steel Buildings and Bridges
AISC 316	Manual of Steel Construction - 14th Edition
AISC 335	Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design with Commentary (latest edition).
AISC 348	Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts (prepared by the Research Council on Structural Connections)

2. American Society for Testing and Materials (ASTM)

ASTM A36	Standard Specification for Carbon Structural Steel
ASTM A53	Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless
ASTM A123	Standard Specification for Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products
ASTM A153	Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware
ASTM A276	Standard Specification for Stainless Steel Bars and Shapes
ASTM A325	Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A490	Standard Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength

ASTM A500 Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

ASTM A780 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coating

ASTM A992 Standard Specification for Structural Shapes

ASTM B695 Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel

ASTM F1554 Standard Specification for Anchor Bolts, Steel, 36, 55 and 105-ksi Yield Strength

3. American Welding Society (AWS)

AWS A2.4 Standard Symbols for Welding, Brazing and Non-destructive Examination

AWS A5.1 Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding

AWS D1.1 Structural Welding Code - Steel

AWS D1.6 Structural Welding Code - Stainless Steel

4. California Building Code (CBC)

5. Code of Federal Regulations (CFR)

29 CFR Part 1926 Subpart R - Steel Erection

B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply, unless otherwise noted.

1.04 SUBMITTALS

A. Submit, in accordance with Section 01300, shop drawings and product data including the following:

1. Erection drawings, detailed shop drawings, anchor bolt placement drawings, schedules, and data for all structural steel. Approval will be for strength only and shall not relieve the Contractor of responsibility for proper fit of members and for supplying all material required by the Contract Documents. Clearly identify the portion of the Work represented by the shop drawings, and clearly identify the placement of each piece shown on the detail drawings. Identify all welds in conformance with AWS A2.4. Mark numbers painted on the shop assembled pieces of steel shall be the same mark numbers used on the detailed shop and erection drawings.

2. Product data and installation instructions for Contractor proposed load indicator bolts or direct tension indicators.

3. Documentation of certification of the steel fabricator under the AISC Quality Certification Program.

B. Samples

1. Submit two samples of Contractors' proposed load indicator bolts or direct tension indicators.

C. Test Reports

1. Certified mill test reports for the structural steel and the bolting materials.

2. Certifications that welders are qualified, in accordance with AWS D1.1, on the shop and field welding procedures to be used.

1.05 QUALITY ASSURANCE

A. Structural steel shall be in accordance with the AISC Specification for Structural Steel Buildings Allowable Stress Design and Plastic Design, including Supplement No. 1 and the Code of Standard Practice for Steel Buildings and Bridges, unless otherwise specified herein.

B. Welding shall be in accordance with AWS D1.6 unless otherwise specified herein or in the AISC Specification.

C. High strength bolt materials, accessories and installation shall be in accordance with the AISC Specification for Structural Joints Using ASTM A325 or A490 Bolts.

D. When pre-tensioning of high strength bolts is required, the Contractor shall provide a tension calibrator on site for pre-installation verification of fastener assemblies and bolt tensioning procedures. Where calibrated wrench pre-tensioning is used, each installation wrench shall be calibrated daily.

E. Erection of structural steel shall be in conformance with 29 CFR Part 1926, Subpart R (OSHA requirements for steel erection).

F. The steel fabricator shall be certified under the AISC Quality Certification Program.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials promptly so as to cause no delay with other parts of the work.

B. Store materials on skids and not on the ground. Pile and block materials so that they will not become bent or otherwise damaged.

C. Handle materials with cranes or derricks as far as practicable. Do not dump steel off cars or trucks nor handle in any other manner likely to cause damage.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials for structural steel members and connection, unless otherwise indicated, shall comply with the following:

1.	Standard rolled steel sections:	
	Wide flanges	ASTM A992, Grade 50
	Channels, angles & other	ASTM A36
2.	Pipe columns	ASTM A53, Grade B
3.	Structural steel tubing:	
	Rectangular/Square	ASTM A500, Grade B (Fy = 46 ksi)
	Round	ASTM A500, Grade B (Fy = 42 ksi)

4.	Structural bars, plates and similar items	ASTM A36
5.	Stainless steel	ASTM A276, Type 316L
6.	Stainless steel bolts, nuts and washers	ASTM A320, Type 316L
7.	High strength steel bolts	ASTM A325 or ASTM A490
8.	Welding electrodes:	AWS A5.1, E70XX.
9.	Shop primer:	As specified in Division 9.

2.02 FABRICATION

A. Match mark materials for field assembly. Ream unmatched holes in shop assembly of field connections. Reject and replace with new pieces any piece weakened by reaming to a point where the strength of the joint is impaired, at no additional cost to the City.

B. Welding of parts shall be done only where shown on the Drawings or specified herein and by welders and welding operators qualified for the procedures used.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Furnish and install temporary bracing to provide stability during erection and to prevent distortion or damage to the framing due to wind, seismic, or erection forces. Remove temporary bracing when erection is complete.

B. Use drift pins only to bring members into position and not to enlarge or distort holes.

C. Make all steel-to-steel connections by high strength bolting except where field welding is shown or specified. Bolt holes shall be 1/16-inch larger than the nominal size of bolts.

D. Tighten all bolted connections to full pretension by turn-of-nut or calibrated wrench tightening unless load indicator bolts or direct tension indicators have been approved.

E. Field welding shall be done only where shown or specified and only by welders qualified for the procedures used. No welding shall be done when surfaces are wet, exposed to rain, snow or wind, or when welders are exposed to inclement conditions that will hamper good workmanship.

F. Each bolting crew and each welder shall be assigned an identification mark. This mark shall be made at each completed connection with a paint stick.

G. After erection and field testing of connections, prime paint abrasions, field welds, and unprimed surfaces using shop primer, except surfaces designated to be unpainted or surfaces in contact with concrete.

H. Field painting shall be as specified in Section 09900.

3.02 FIELD TESTING

A. Allow the Engineer free access to the work. Notify the Engineer in writing 4 working days in advance of high strength bolting and field welding operations, including pre-installation verification of high strength bolt assemblies.

B. Fastener assemblies which include bolts to be pre-tensioned shall be tested on site in a tension calibrator for pre-installation verification in accordance with the AISC Specification for Structural Joints using ASTM A325 Bolts

C. All high strength bolting will be inspected visually. High strength bolts to be pre-tensioned by the turn-of-nut method shall have the turned portion marked with reference to the steel being connected after the nut has been made snug and prior to final tightening. Retighten rejected bolts or remove and provide new bolts. In cases of disputed bolt installations, the bolts in question shall be checked using a calibrated wrench, at no additional cost to the Owner.

D. Field welding will be inspected visually. Comply with all requests of inspectors to correct deficiencies.

E. The fact that steel work has been accepted at the shop and mill will not prevent its final rejection at the site, before or after erection, if it is found to be defective.

F. Remove rejected steel work from the site within 10 working days after notification of rejection.

END OF SECTION

SECTION 05220

CONCRETE BOLTS

PART 1 - GENERAL

1.01 WORK OF THIS SECTION

A. The Contractor shall provide concrete anchor bolts, inserts, complete, in accordance with the contract documents. Principal items are anchor bolts placed in concrete, adhesive anchors, and drilled anchors.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. The work of the following sections apply to the work of this section. Other sections, not referenced below, shall apply to the extent required for proper performance of the work.

1. Section 03200 - Reinforcement Steel

2. Section 03300 - Cast-in-Place Structural Concrete

3. Section 03360 – Grout

4. Section 05500 - Miscellaneous Metals

5. Steel supports hangers, brackets and other miscellaneous items such as bolts accessory to mechanical and electrical installations indicated or detailed on the contract documents and in Divisions 11, 13, 15 and 16.

1.03 REFERENCE, SPECIFICATIONS, CODES AND STANDARDS

A. Except as otherwise indicated in this section of the specifications, the CONTRACTOR shall comply with the latest adopted editions of the Standard Specifications for Public Works Construction (SSPWC), together with the latest adopted editions of the Regional Amendments.

B. The latest edition of the California Building Code (CBC).

C. Commercial Standards:

1. American Concrete Institute (ACI):

318 Building Code Requirements for Structural Concrete

350 Code Requirements for Environmental Engineering Concrete Structures

2. American Institute of Steel Construction (AISC):

360 Specifications for Structural Steel Buildings

D. Federal Specifications (Current Edition):

MIL-A-907E	Antiseize Thread Compound, High Temperature

E. ASTM Standards in Building Codes (Current Edition):

ASTM A193	Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and other Special Purpose Applications
ASTM A194	Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
ASTM A276	Specification for Stainless Steel Bars and Shapes
ASTM F593	Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
ASTM F594	Specification for Stainless Steel Nuts

1.04 SUBMITTALS

A. Shop Drawings: Shop drawings of all concrete bolts shall be submitted for review in accordance with Specification Section 01300.

B. An ICC Evaluation Service, Inc. report listing the ultimate load capacity in tension and shear for each size and type of adhesive concrete anchor used shall be submitted for review. The Contractor shall submit manufacturer's recommended installation instructions and procedures for all adhesive anchors for review and approval. The Contractor shall follow approved procedures during installation of concrete anchors.

C. No substitution for the indicated adhesive anchors will be considered unless accompanied with ICC Evaluation Services, Inc. report verifying strength and material equivalency, including temperature at which load capacity is reduced to 90 percent of that determined at 75 degrees F.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Anchor Bolts: Unless otherwise indicated, anchor bolts shall be fabricated of materials as follows:

1.	Stainless steel bolts, nuts, washers	ASTM F 593, Type 316
2.	Stainless Steel nuts	ASTM F594, Type 316
3.	Plates and washers	ASTM A276

B. Buried or Submerged Bolts: Unless other corrosion-resistant bolts are indicated, all bolts, anchor bolts, nuts and washers which are buried, submerged, or below the top of the wall inside any hydraulic structure shall be Type 316 stainless steel conforming to ASTM A193 for bolts and to ASTM A194 for nuts. All threads on stainless steel bolts shall be protected with an antiseize

lubricant suitable for submerged stainless steel bolts, to meet government specification MIL-A-907E.

1. Antiseize lubricant shall be classified as acceptable for potable water use.

2. Antiseize lubricant shall be "PURE WHITE" by Anti-Seize Technology, Franklin Park, IL 60131, AS-470 by Dixon Ticonderoga Company, Lakehurst, NJ, 08733, or approved equal.

C. Bolt Requirements:

1. All bolts and cap screws shall have hexagon heads and nuts shall be Heavy Hexagon Series.

2. The length of all bolts shall be such that after joints are made up, each bolt shall extend through the entire nut, but in no case, more than 1/2 inch beyond the nut.

D. Expansion Anchors: Expansion anchors shall be HILTI KBTZ2 or equal. No substitutions will be considered unless accompanied with ICC evaluations Services, Inc. report verifying strength and material equivalency.

E. Epoxy Adhesive Anchors: Epoxy adhesive anchors shall be HILTI HIT-HY 200-R V3 or equal. No substitutions will be considered unless accompanied with ICC evaluations Services, Inc. report verifying strength and material equivalency.

PART 3 - EXECUTION

3.01 FABRICATION AND INSTALLATION REQUIREMENTS

A. Fabrication and Installation: Except as otherwise indicated, the fabrication and installation of anchor bolts shall conform to the requirements of the American Institute of Steel Construction “Steel Construction Manual".

B. Install adhesive and drilled anchor bolts in accordance with method specified in the ICC evaluation report for manufacturer product.

3.02 INSPECTION

A. The Client reserves the right to inspect all materials and workmanship covered in this section. Such inspections will not relieve the Contractor of its responsibility to furnish materials and workmanship in accordance with the specifications. If inspections indicate that the materials or workmanship are defective, the Contractor shall remove and replace the defective work at no additional cost of the Client.

END OF SECTION

SECTION 05500

MISCELLANEOUS METAL

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install covers, grates, frames, manhole rungs and other miscellaneous metals as shown on the Drawings and specified herein. The miscellaneous metal items include but are not limited to the following:

1. All metal frames, ladders, stair rails, floor opening frames including gratings and supports.
2. Prefabricated access hatches and frames.
3. Anchors and anchor bolts except those specified to be furnished with all equipment.
4. Cast iron frames, covers, grates, drain leaders and drains.
5. Steel plates, overhead steel door frames, angle frames, plates and channels.
6. Perforated metal screening and metal framing for removable screening.

1.02 RELATED WORK

A. Section 05120 Structural Steel

B. Anchor bolts for equipment are included in the respective Sections of Divisions 11 and 15.

C. Pipe hangers, supports and concrete inserts are included under Division 15.

D. Pipe sleeves, wall sleeves, and wall castings are included in the respective Sections of Division 15.

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Commercial Standards

1. Aluminum Association (AA)

AA 5052	Aluminum Sheet and Plate, Rolled Rod and Bar and Drawn Tube
AA 6061 T6	Aluminum Sheet and Plate
AA 6061 T5	Aluminum Extruded Shapes
AA 6063 T6	Aluminum Extruded Pipe
AA C22A41:	
A41	Clear Anodic Coating, Class I
C22	Finish, Medium Matte

2. American Society for Testing and Materials (ASTM)

ASTM A36	Standard Specification for Carbon Structural Steel.
ASTM A48	Standard Specification for Gray Iron Castings.

ASTM A53 Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless.

ASTM A123 Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.

ASTM A153 Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.

ASTM A307 Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

ASTM A536 Standard Specification for Ductile Iron Castings.

3. American Iron and Steel Institute (AISI)

4. American Welding Society (AWS)

AWS D1.1 Structural Welding Code - Steel

B. Federal Specification

FS FF B 575C Bolts, Hexagon and Square

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

1.04 SUBMITTALS

A. Submit, in accordance with Section 01300, detail drawings showing materials, sizes of members, method of assembly, anchorage, and connection to other members shall be submitted for approval before fabrication.

B. Samples shall be submitted at the request of the Engineer for concurrent review with shop drawings.

C. Submit drawings and data for the sections of removable expanded metal screening including details, material data, fasteners, dimensions and any other pertinent descriptive literature.

D. Quality Control Submittals:

1. Welder/welding operator qualifications.
2. Welding inspector credentials.
3. Testing agency personnel credentials.
4. Welding Inspector’s Report.

1.05 COORDINATION

A. The work in this Section shall be completely coordinated with the work of other Sections. Verify at the site both the dimensions and work of other trades adjoining items of work in this Section before fabrication and installation of items herein specified.

B. Furnish to the pertinent trades all items included under this Section that are to be built into the work of other Sections.

1.06 FIELD MEASUREMENTS

A. Field measurements shall be taken at the site to verify or supplement indicated dimensions and to ensure proper fitting of all items.

1.07 QUALITY ASSURANCE

A. Qualifications:

1. Welder/Welding Operator: In accordance with AWS D1.1 (Annex E), AWS B2.1 (App. A), or ASME BPVC SEC IX (Form QW-484).
2. Welding Inspector: Certified in accordance with AWS QC1, and having prior experience with the welding codes specified.
3. Weld Testing Agency: Personnel performing tests shall be NDT Level II Certified in accordance with ASNT SNT-TC-1A.

B. Regulatory Requirements:

1. Anchoring Systems: Current evaluation and acceptance reports by ICBO or other similar code organization.
2. Welding Procedures: Follow the requirements of AWS D1.1 and AWS D1.2.

PART 2 - PRODUCTS

2.01 ANCHORS, BOLTS AND FASTENING DEVICES

A. Anchors, bolts, etc, shall be furnished as necessary for installation of the work of this Section.

B. The bolts used to attach the various members to the anchors shall be the sizes shown or required. Stainless steel shall be attached to concrete or masonry by means of stainless steel machine bolts, and iron or steel shall be attached with steel machine bolts, unless otherwise specifically noted.

C. For structural purposes, unless otherwise noted, epoxy bolts shall be Hilti HIT-RE 500-SD; Simpson SET-XP Epoxy Adhesive Anchor; Powers PE1000+ Epoxy Adhesive Anchor or equal and have a current ICC evaluation report. When length of bolt is not called for on the Drawings, the length of bolt provided shall be sufficient to place the bolt a minimum of 1 in behind the reinforcing steel within the concrete. Embedment needs to be designed to meet Building Code requirements. Material shall be as noted on the Drawings. If not listed, material shall be stainless steel.

D. Bolts and nuts shall conform to Federal Specification FF B 575C. Bolts and nuts shall be hexagon type. Stainless steel bolts, nuts, screws, washers and related appurtenances shall be equal to AISI Type 316. All exposed portions of anchor bolts installed in concrete shall be greased, wrapped in burlap or plastic sleeve and tied.

2.02 ALUMINUM ITEMS

A. Aluminum gratings shall be of serrated I Bar Aluminum Alloy 6061 T6, fabricated to the depths and thicknesses shown on the Drawings and shall be Reliance Steel Products Company, I Lok Type 7/8 R4 Aluminum Grating; IKG Borden, Aluminum Swaged Locked I Bar Grating Type IB, or equal. All openings 2-in and greater in diameter shall be banded with a bar of the same depth and

thickness as the main bearing bars of the grating, or furnished with continuous cross bridges. Each cut bar shall be welded to the band if banding is utilized. The ends of all grating sections shall be likewise banded. Clamps and bolts used for attaching grating to supporting members shall be stainless steel. All grating shall be clamped unless noted otherwise. Clamps shall be as recommended by the manufacturer.

B. Aluminum nosing at concrete stairs shall be an extrusion of 4 in minimum width with abrasive filled and shall be Wooster Products, Inc., Alumogrit Treads, Type 116; equal by Barry Pattern and Foundry Co.; Andco, or equal. Embedded anchors shall be furnished with a minimum of three anchors per tread.

C. Aluminum ladders shall be fabricated to the dimensions and details and installed as shown on the Drawings. Treads to be of cast aluminum by Dixie Metals, Inc. of Fort Lauderdale, FL.

D. Aluminum safety gate shall be fabricated of extruded aluminum as detailed.

E. Prefabricated checkerplate aluminum floor hatches shall be Bilco Co., Type J or Type JD; equal by Halliday Products, Inc., or equal, sized as shown. Hatches with either dimension over 3 ft-6 in shall be double leaf type. Hatches shall be designed for a live load of 300 lbs per sq ft. Drainage from the frame drain hole shall be piped to the nearest drain piping. Heavy duty stainless steel hardware shall be used throughout the fabrication. Doors shall be equipped with heavy duty stainless steel hinges, stainless steel pins, spring operators and an automatic hold open arm having a vinyl covered release handle. Hinges shall be through bolted to the cover and frame with tamperproof stainless steel lock bolts and stainless steel bolt and lock nut, respectively.

F. Structural aluminum angle and channel door frames shall be provided as shown on the Drawings and shall be anodized. Frames shall be fabricated with not less than three anchors on each jamb.

G. Miscellaneous aluminum shapes and plates shall be fabricated as shown on the Drawings. Angle frames for hatches, beams, grates, etc, shall be furnished complete with welded strap anchors attached. Furnish all miscellaneous aluminum shown but not otherwise detailed. Structural shapes and extruded items shall conform to the detail dimensions or the plans within the tolerances published by the American Aluminum Association.

2.03 STEEL ITEMS

A. Sleeves shall be steel or cast iron pipe in walls and floors with end joints as shown on the Drawings. All pipe sleeves shall have center anchor around circumference as shown.

B. Structural steel angle and channel door frames shall be provided as shown on the Drawings and shall be galvanized after fabrication. Frames shall be fabricated with not less than three anchors on each jamb.

C. All miscellaneous lintels and closures not shown on the Drawings shall be galvanized steel and shall be provided as a part of this Section.

D. Miscellaneous steel pipe for sleeves and lifting attachments and other uses as required shall be Schedule 40 pipe fabricated according to the details as shown on the Drawings.

E. Frames, covers and grates for manholes, catch basins and inlets shall be of a good quality, strong, tough even grained cast iron except as otherwise specified below. Castings shall be as manufactured by the U. S. Foundry; Neenah Foundry; Mechanics Iron Foundry, or equal. Sizes shall be as shown

on the Drawings. Covers to have letters "WATER", "SEWER" or "DRAIN", as applicable, embossed on top.

F. Miscellaneous steel shall be fabricated and installed in accordance with the Drawings and shall include: beams, angles, support brackets, closure angles in roof at edge of T beam; base plates to support ends of T beams; door frames; splice plates, anchor bolts (except for equipment furnished in Divisions 11, 13, 14 and 15); lintels and any other miscellaneous steel called for on the Drawings and not otherwise specified.

2.04 CAST IRON ITEMS

A. Outside pipe clean out frames and covers shall be heavy duty, R 6013 R 6099 series as manufactured by Neenah Foundry Co., or equal. All outside pipe clean outs shall be 6 in diameter.

PART 3 - EXECUTION

3.01 FABRICATION

A. All miscellaneous metal work shall be formed true to detail, with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture and free from defects impairing strength or durability.

B. Connections and accessories shall be of sufficient strength to safely withstand stresses and strains to which they will be subjected. Steel accessories and connections to steel or cast iron shall be steel, unless otherwise specified. Threaded connections shall be made so that the threads are concealed by fitting.

C. Welded joints shall be rigid and continuously welded or spot welded as specified or shown. The face of welds shall be dressed flush and smooth. Exposed joints shall be close fitting and jointed where least conspicuous.

D. Welding of parts shall be in accordance with the Standard Code for Arc and Gas Welding in Building Construction of the AWS and shall only be done where shown, specified, or permitted by the Engineer. All welding shall be done only by welders certified as to their ability to perform welding in accordance with the requirements of the AWS Code. Component parts of built up members to be welded shall be adequately supported and clamped or held by other adequate means to hold the parts in proper relation for welding.

E. Welding of aluminum work shall be on the unexposed side as much as possible in order to prevent pitting or discoloration.

F. All aluminum finish exposed surfaces, except as specified below, shall have manufacturer's standard mill finish. Aluminum handrails shall be given an anodic oxide treatment in accordance with the Aluminum Association Specification AA C22 A41. A coating of metha-crylate lacquer shall be applied to all aluminum before shipment from the factory.

G. Castings shall be of good quality, strong, tough, even grained, smooth, free from scale, lumps, blisters, sand holes, and defects of any kind which render them unfit for the service for which they are intended. Castings shall be thoroughly cleaned and will be subjected to a hammer inspection in the field by the Engineer. All finished surfaces shown on the Drawings and/or specified shall be machined to a true plane surface and shall be true and seat at all points without rocking. Allowances shall be made in the patterns so that the thickness specified or shown shall not be reduced in

obtaining finished surfaces. Castings will not be acceptable if the actual weight is less than 95 percent of the theoretical weight computed from the dimensions shown. The Contractor shall provide facilities for weighing castings in the presence of the Engineer showing true weights, certified by the supplier.

H. All steel finish work shall be thoroughly cleaned, by effective means, of all loose mill scale, rust, and foreign matter before shipment and shall be given one shop coat of primer compatible with finish coats specified in Painting Section after fabrication but before shipping. Paint shall be applied to dry surfaces and shall be thoroughly and evenly spread and well worked into joints and other open spaces. Abrasions in the field shall be touched up with primer immediately after erection. Final painting is specified in Painting Section 09900.

I. Galvanizing, where required, shall be the hot dip zinc process after fabrication. Following all manufacturing operations, all items to be galvanized shall be thoroughly cleaned, pickled, fluxed, and completely immersed in a bath of molten zinc. The resulting coating shall be adherent and shall be the normal coating to be obtained by immersing the items in a bath of molten zinc and allowing them to remain in the bath until their temperature becomes the same as the bath. Coating shall be not less than 2 oz/sq ft of surface.

3.02 INSTALLATION

A. Install all items furnished except items to be embedded in concrete which shall be installed under Division 3. Items to be attached to concrete after such work is completed shall be installed in accordance with the details shown. All dimensions shall be verified at the site before fabrication is started.

B. All steel surfaces to come in contact with exposed concrete shall receive a protective coating of an approved heavy bitumastic troweling mastic applied in accordance with the manufacturer's instructions prior to installation.

C. Where aluminum is embedded in concrete, apply a heavy coat of approved bitumastic troweling mastic in accordance with the manufacturer's instructions prior to installation.

D. Where aluminum contacts concrete, apply a heavy brush coat of zinc-chromate primer and provide a 1/32 in neoprene gasket between the aluminum and the concrete.

E. Where aluminum contacts a dissimilar metal, apply a heavy brush coat of zinc chromate primer and provide a 1/32 in neoprene gasket between the aluminum and the dissimilar metal.

END OF SECTION

SECTION 06615

FIBERGLASS REINFORCED PLASTIC COMPONENTS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all labor, material and equipment to fabricate and install FRP grating, tread and guardrail systems as indicated on the Drawings and as specified herein.

1.01 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM D349 Standard Test Methods for Laminated Round Rods Used for Electrical Insulation.
2. ASTM D638 Standard Test Method for Tensile Properties of Plastics.
3. ASTM D790 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
4. ASTM D792 Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.

B. American Iron and Steel Institute (AISI)

C. California Building Code (CBC)

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

1.02 SUBMITTALS

A. Contractor shall submit complete shop drawings for approval in accordance with Section 01300.

B. Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.
4. Design tables, with span length and deflection limits, under various Uniform and concentrated loads.
5. Construction materials.

C. Shop Drawings for FRP structural shapes, tread and grating:

1. Plan and section of FRP structural shapes, tread and grating installation.

D. Design calculations for FRP products stamped and signed by a structural engineer registered in the State of California and experienced in the design of FRP structures. Calculations shall include the following:

1. Dead loads.

2. Live loads.

3. All fastener and bolted connections.

1.03 QUALITY ASSURANCE

A. Platforms, stairs, catwalks and similar walkways shall meet the requirements of the standards of the Occupational Safety and Health Administration, the Division of Industrial Safety of the State of California, and the California Building Code.

B. Qualifications are limited to experienced manufacturers and fabricators producing FRP structural shapes and grating or similar to that indicated for this project, with adequate production capacity, so as to not delay the work.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store components until installation inside under cover. If stored outside, support off of the ground on a pallet or similar support and under a tarp or suitable cover.

1.05 WARRANTY

A. The Contractor shall obtain from the manufacturer a warranty for all materials and appurtenances for three years from the date of substantial completion.

PART 2 - PRODUCTS

2.01 FRP STRUCTURAL SHAPES, TREAD AND GRATING

A. General:

1. Material used in the manufacturing of FRP structural shapes and grating shall be of the best quality and free from any defects and imperfections that may affect the performance of the finished product.

2. All material shall be of type and quality specified; where quality is not specified it shall be the best of the respective types and application for the intended purpose.

3. All FRP components shall be manufactured using the pultrusion manufacturing process, with either thermoset polyester or thermoset vinyl ester resin, including flammability and ultraviolet (UV) inhibitor additives. A synthetic surface veil shall be the outermost layer of the exterior surface. The fiber reinforced polymer composites profiles shall achieve a class 1 flammability rating (< 25) per ASTM E84 TEST method.

4. Structural fiber reinforced polymer composites member composition shall consist of a glass fiber reinforced polyester or vinyl ester matrix, approximately 50% resin-to-glass ratio. A synthetic surface veil shall be the outermost layer of the exterior surfaces. Continuous glass strand roving shall be internally used for transverse strength.

5. All cut ends, holes and abrasions of fiber reinforced polymer composites products shall be sealed with a compatible resin coating to prevent intrusion of moisture where applicable.

6. All exposed surfaces shall be smooth and true to form.

7. FRP components shall have integral colors acceptable to the Owner selected from standard resin colors.

B. FRP Handrails:

1. Handrail: Vertical posts for handrails are to be 2-1/8” x 3/16” thick square tube, minimum. Maximum post spacing shall be 3’-6”. Horizontal rails are to be 1-3/4” x 1/8” thick square tubes, minimum. Kick plate is to be 9/16" deep x 4" wide x 1/8” thick with two reinforcing corrugations, minimum.

   a. The completed handrail installation shall meet the following load requirements with a minimum factor of safety of 2.0:

      (1) Concentrated Load: 200 lb applied in any direction at any point on the top rail.

      (2) Uniform Load: 50 lb/lf applied in any direction on the top rail.

      (3) Loads are assumed not to act concurrently.

      (4) All rails, posts, and kick plates are to be integrally pigmented yellow.

2. Mounting Brackets and Hardware: Brackets shall be FRP with 316 stainless steel anchor bolts and rivets and sized to securely support the guardrail system and grating at the design loads noted herein.

C. Pultruded High Load Capacity (HLC) FRP Tread and Grating:

1. Tread and Grating components shall be high strength and high stiffness pultruded elements having a maximum of 65% of glass content (by weight) of continuous roving and continuous strand mat fiberglass reinforcements. The finished surface of the product shall be provided with a surfacing veil to provide a resin rich surface which improves corrosion resistance and resistance to ultraviolet degradation. Bearing bars shall be interlocked and epoxied in place with a two-piece cross rod system to provide a mechanical and chemical lock.

2. Depth: 1-1/2”, with a tolerance of plus or minus 1/16".

3. Mesh Configuration: 1-3/16” load bar spacing; 6” tie bar spacing on centers for 1-1/2” deep grating.

4. Grating components shall be provided with a non-slip surface.

5. The completed grating installation shall meet the following load requirements with a minimum factor of safety of 2.0:

   a. Concentrated Load: 300 lb applied at any location on the grating.

b. Uniform Load: 40 lb/sqft applied uniformly on the grating.

c. Loads are assumed not to act concurrently.

6. Maximum allowable span shall be 4’-6” with a maximum deflection of 1/4”.

7. Grating shall bear on structural supports with a minimum width of 2”.

8. Substitutions: Other products of equal strength, stiffness, corrosion resistance and overall quality may be submitted with the proper supporting data to the engineer for approval.

E. STAIRS

1. Fabricate stairs, landings, and component connections to support live loads of minimum 100 lbs/ft2 with deflection of stairs and landings not exceeding l/360 of span.

2. Verify dimensions on site prior to shop fabrication. Detail stair risers, treads, and landings to conform with the requirements of the latest edition of OSHA.

3. Use handrailing as specified in section 2.01.B.

4. Use stair treads as specified in section 2.01.C.

5. Use 316 stainless steel bolts throughout.

2.02 FABRICATION

A. Completely fabricate handrail components ready for field assembly before shipment to site.

2.03 MANUFACTURERS

A. Acceptable Manufacturers: Fibergrate or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Field cut and drill fiberglass reinforced plastic products with carbide or diamond tipped bits and blades.

C. All field-cut and drilled edges, holes and abrasions shall be sealed with a catalyzed resin compatible with the original resin as recommended by the manufacturer. The sealing of the edges shall prevent premature fraying at the field cut edge.

END OF SECTION

SECTION 07920

SEALANTS AND CAULKING

PART 1 - GENERAL

1.01 WORK OF THIS SECTION

A. The CONTRACTOR shall provide caulking, sealing, moisture protection, and appurtenant Work for sealing joints in non-water bearing surfaces, complete and in accordance with the Contract Documents.

1.02 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. The current edition of the California Building Code (CBC)

B. Except as otherwise indicated, the current editions of the following apply to the work of this Section:

1. Federal Specifications:

   a. TT S 001543A Sealing Compound, Silicone Rubber Base, (For Caulking, Sealing and Glazing in Buildings and Other Structures).

   b. A-A-1556 Sealing Compound, Elastomeric Type, Single Component, (For Caulking, Sealing, and Glazing in Buildings and Other Structures).

   c. TT S 00227E (3) Sealing Compound, Elastomeric Type, Multi-Component, (For Caulking, Sealing and Glazing in Buildings and Other Structures).

   d. SS-S-200E (2) Sealant, Joint, Two Component, Cold Applied, for Portland Cement Pavement

2. ASTM Standards in Building Codes:

   a. ASTM C 557 Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing

   b. ASTM C 834 Specification for Latex Sealing Compounds.

   c. ASTM C 919 Practice for Use of Sealants in Acoustical Applications.

   d. ASTM C 920 Specification for Elastomeric Joint Sealants.

   e. ASTM D 41 Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.

   f. ASTM D 226 Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

   g. ASTM D 312 Specification for Asphalt Used in Roofing.

   h. ASTM D 1752 Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

C. Manufacturer's Standards: In addition to the standards listed above, the sealants and caulking products and their application shall be in accordance with the manufacturer's published recommendations and specifications.

1.03 CONTRACTOR SUBMITTALS

A. Samples: The CONTRACTOR shall submit samples (including color samples) of all the caulking and sealant materials and other moisture protection materials proposed for use on the Work. The samples shall be clearly marked with the manufacturer's name and product identification.

B. Technical Data: The CONTRACTOR shall submit a complete materials list along with the manufacturer's technical data and literature, specifications, joint width and depth tables, and installation instructions.

C. Certificates: The CONTRACTOR shall submit, if requested by the OWNER'S REPRESENTATIVE, certificates from an independent testing laboratory approved by the OWNER'S REPRESENTATIVE, certifying that the submitted materials meet all the requirements of the ASTM and Federal Specifications cited.

D. Warranty: The CONTRACTOR shall provide a 5-year written warranty of the entire sealant installation against faulty and/or incompatible materials and workmanship, together with a statement that it agrees to repair or replace, to the satisfaction of the OWNER, at no additional cost to the OWNER, any such defective areas which become evident within said 5-year warranty period.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials: Manufactured materials shall be delivered in original, unbroken packages or containers bearing the manufacturer's label. Packages or containers shall be delivered to the site with seals unbroken.

B. Shelf Life: Materials whose shelf-life dates have expired shall not be used in the Work. Such materials shall be promptly removed from the project site.

C. Storage: All materials shall be carefully stored in accordance with the manufacturer's instructions, in an area that is protected from deleterious elements, and in a manner that will prevent damage to the product.

PART 2 - PRODUCTS

2.01 SEALANTS AND CAULKING MATERIALS

A. Caulking and sealing materials shall conform to the following requirements:

1. Significant Movement Sealants (+ 25% movement capability):

   a. Expansion wall joints; masonry and metal curtain wall joints; precast concrete joints and concrete panels; perimeter sealing (windows, doors, and panels); control joints; interior and nontraffic horizontal joints:

      (1) Two-component, nonsag, polyurethane or polysulfide sealant conforming to Federal Specification TT S 00227E (3), Class A, Type II, and ASTM C 920; Type M; Class 25; Grade NS.
         (a) Products Research & Chemical Corp. ARC 2.
         (b) Progress Unlimited AIso Flex 2000"; or approved equal.

(2) One component, nonsag, low modulus, polyurethane or polysulfide sealant conforming to Federal Specification A-A-1556, Class A, Type II, and ASTM C 920; Type S; Class 25; Grade NS.
(a) Products Research & Chemical Corp. ARC 1".
(b) Tremco “Dymonic”; or approved equal.

b. Horizontal joints exposed to fuel spillage:

(1) Two component, self-leveling, fuel resistant, polyurethane or polysulfide sealant conforming to Federal Specification SS S 200E(2), Type H, and ASTM C 920; Type M;Class 25; Grade P.
(a) Products Research & Chemical Corp. “3105 S”.
(b) Pacific Polymers Inc. “ElastoThane 200"; or approved equal.

c. Horizontal joints not exposed to fuel spillage:

(1) Two component, self-leveling, polyurethane or polysulfide sealant conforming to Federal Specification TT S 00227E(3), Class A, Type I, and ASTM C 920; Type M; Class 25; Grade P.
(a) Products Research & Chemical Corp. “RC 2SL”.
(b) Bostic “Chem Calk 550"; or approved equal.

(2) One component, self-leveling, polyurethane or polysulfide sealant conforming to Federal Specification A-A-1556, Class A, Type I, and ASTM C 920; Type S; Class 25; Grade P.
(a) Products Research & Chemical Corp. “6006".
(b) Mameco “Vulkem 45"; or approved equal.

2. Glazing Sealants:

a. Nonstructural Applications:

(1) One component, nonsag, medium modulus, neutral cure, silicone sealant conforming to Federal Specification TT S 1543A, Class A, and ASTM C 920; Type S; Class 25; Grade NS.
(a) Products Research & Chemical Corp. “4000".
(b) Dow Corning “795"; or approved equal.

(2) One Component, nonsag, high modulus, acetoxy cure, silicone sealant conforming to Federal Specification TT S 001543A, Class A, and ASTM C 920; Type S; Class 25; Grade NS.
(a) General Electric “1200".
(b) Dow Corning A999"; or approved equal.

3. Interior Sealant and Caulking:

a. General Applications:

(1) One component, acrylic latex caulking conforming to ASTM C 834.
(a) Pecora Corp. “AC 20".
(b) Bostic “Chem-Calk 600"; or approved equal.

b. Nonexposed Acoustical Applications:

(1) One component, nondrying, nonhardening, nonshrinking, acoustical caulking conforming to ASTM C 919 as manufactured by:
(a) Inmont Company "Prestite 579.64".
(b) Tremco Acoustical Sealant.
(c) United States Gypsum, "Acoustical Sealant".
(d) W.W. Henry Type 313 Acoustical Sealant.

4. Acoustic Sheet Caulking: For use on all outlet boxes including intercoms, telephone or other services that require penetrations in the walls, acoustic sheet caulking shall be resilient synthetic polymer, self-adhesive, c-inch thick, 6 inch by 8 inch, sheet acoustic sealer. Pads shall be Lowry's Electrical Box Pads as manufactured by Harry A. Lowry & Associates, Inc., 11176 Penrose Street, Sun Valley, CA 91352, (818) 768 4661, (213) 875 0225; or approved equal.

5. Caulking tapes shall be of the butyl-base, vulcanized type.

6. Filler material shall be resilient, closed-cell polyethylene foam conforming to ASTM D 1752, Type II or III, and/or bond breakers of proper size for joint widths. Filler shall be compatible with sealant manufacturer's product and shall not stain the sealant nor the materials to which they are applied.

7. Primer shall be used in accordance with manufacturer's instructions, with all primers being applied prior to the installation of any backer rod or bond breaker tape. Primers shall be as recommended in the manufacturers printed instructions for caulking and sealants and shall not stain the sealant nor the materials to which they are applied. Manufacturer shall be consulted for all surfaces not specifically covered in submittal application instructions.

8. Cleaning and cleanup solvents shall be as recommended in the manufacturer's printed instructions for caulking and sealants.

PART 3 - EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Manufacturer's Recommendations: All work under this Section and all testing, where applicable, shall be performed in accordance with manufacturer's printed recommendations, specifications, and installation instructions except where more stringent requirements are indicated herein; and, except where project conditions require extra precautions or provisions to assure performance of the waterproofing system.

B. Authorized Installers: Caulking, sealants, and moisture protection shall be complete systems, and installed only by installers authorized and approved by the respective material manufacturers.

C. Acoustic Partition Joints: Acoustic partition joints shall be made air and sound-tight with acoustic caulking material.

1. Partitions shall be sealed where indicated. Gypsum panels may have joint treatment applied in the normal manner over sealed joints, or panels may be finished with base or trim as required.

2. A 1/4 inch minimum round bead of sealant shall be applied around all cutouts, such as at electrical boxes and air conditioning ducts, sufficient to seal the openings.

3.02 SEALANT FILLED JOINTS

A. Manufacturer's Representative: The CONTRACTOR shall furnish the onsite services of the sealant manufacturer's representative (before starting sealant work) for inspection of the joints to be sealed and for instructing the installer in the proper use of the materials.

B. Surface Preparation: Joints and spaces to be sealed shall be clean, dry, and free of dust, loose mortar, and other foreign materials. Ferrous metal surfaces shall be cleaned of all rust, mill scale, and other coatings by wire brush, grinding, or sandblasting. Oil and grease shall be removed by

cleaning in accordance with sealant manufacturer's printed recommendations. Protective coatings shall be removed from all aluminum surfaces against which caulking or sealing compound is to be placed. Bituminous or resinous materials shall be removed from surfaces to receive caulking or sealants.

C. Sealant Depth: Sealant depth in joints shall be 2 the width of joint, but not less than 1/8 inch deep and 1/4 inch wide nor more than 2 inch deep and 1 inch wide. All joints shall have a rigid filler material installed to proper depth prior to application of sealant.

D. Joints In Porous Materials: Where required by the manufacturer, sides of joints of porous *materials shall be primed immediately prior to caulking or sealing.

E. Applications: A full bead of sealant shall be applied into the joint under sufficient pressure, with the nozzle drawn across sealant, to completely fill the void space and to ensure complete wetting of contact area to obtain uniform adhesion. During application the tip of the nozzle shall be kept at the bottom of the joint thereby forcing the sealant to fill from the bottom to the top. Sealants shall be tooled immediately after exposure with caulking tool or soft bristled brush moistened with solvent. The finished sealant filled joint shall be slightly concave unless otherwise indicated.

F. Cleaning: After application of sealant and caulking materials, adjacent materials which have been soiled shall be cleaned and left in a neat, clean, undamaged or unstained condition. On porous surfaces, excess sealant shall be removed per sealant or caulking manufacturer's printed instructions.

3.03 ACOUSTIC CAULKING

A. Preparation: Joints and surfaces to be sealed shall be clean, dry, and free of loose materials.

B. Concealed Joints: Concealed joints in acoustic partitions including perimeters and intersections of walls and penetrations through finish work and at conduit ends with boxes shall be sealed with acoustic caulking compound. Backs of electrical boxes shall be sealed with acoustic sheet caulking, covering all holes and knockouts.

END OF SECTION

SECTION 09900

PAINTING AND COATING

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall furnish all labor, materials, equipment and incidentals to provide painting and coating systems for metals, complete, in accordance with the Contract Documents.

1.02 RELATED WORK

A. Section 01300 Submittal Procedures

B. Section 01730 Record Drawings

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

ANSI A13.1	Scheme for the Identification of Piping Systems.
OSHA 1910.144	Safety Color Code for Marking Physical Hazards.
SSPC Volume 2	Systems and Specification - Surface Preparation Guide and Paint Application Specifications.
AWWA C105	Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.
AWWA C217	Petrolatum and Petroleum Wax Tape Coatings for the Exterior of Connections and Fittings for Steel Water Pipelines.

Published standards of The National Association of Corrosion Engineers.

California Occupational Safety and Health Act of 1970.

B. All paints to be applied in the field shall conform to VOC Requirements of regulations of the State of California. Reference SCAQMD regulations, Rule 1113. Architectural Coatings. VOC limits for Industrial Maintenance coatings are set at 100 grams/liter.

1.04 SUBMITTALS

A. All submittals shall be submitted in accordance with Section 01300, “Submittal Procedures”.

B. The following shall be submitted for approval:

1. Copies of manufacturer's technical information, including paint label analysis and application instructions for each material proposed for use.
2. Each material shall be listed and cross-referenced to the specific paint and finish system and application, and shall be identified by the manufacturer's catalog number and general classification.

3. Copies of the manufacturer's complete color charts for each coating system.

4. Certifications from manufacturers shall be provided, verifying that the factory applied prime coats are compatible with specified finish coatings.

5. The Agency shall be notified in writing of anticipated problems using the coating systems as specified with substrates primed by others. Such notification shall be included with the equipment submittals.

6. Pipe Markers shall conform to Agency requirements and Section 15051, “General Piping Requirements”.

    a. Submit copies of manufacturer's technical brochure, including color chart.

7. Upon completion of the Work, three (3) copies of a detailed maintenance manual including the following information shall be furnished:

    a. Product name and number.

    b. Name, address and telephone number of manufacturer and local distributor.

    c. Detailed procedures for routine maintenance and cleaning.

    d. Detailed procedures for light repairs such as dents, scratches and staining.

C. The Contractor shall submit to the Agency an itemized schedule of the surfaces to be painted.

1. Shop drawings and samples shall be submitted for review at least 30-days prior to any painting or coating application.

2. After approval of submittals and prior to beginning work, the Agency will note on the schedule the selected color to be furnished.

D. All systems specified in Part 2.05 have undergone substantial research and are deemed appropriate for this Work.

1. If the Contractor proposes a coating system other than those specified herein, the manufacturer shall submit reference documentation for a minimum of five (5) similar installations, which have been in service for more than five (5) years in the United States.

2. Reference documentation shall include installation location/details, installation date, current owner contact information, and contractor/applicator contact information.

1.05 DESCRIPTION

A. Scope:

1. The Contractor shall furnish all labor, materials, equipment and incidentals required to provide painting as shown and specified herein.

2. The extent of painting work shall be as shown on the Drawings and as specified herein.

3. The work includes the painting and finishing of all interior and exterior items and surfaces throughout the Project except as otherwise shown or specified.

    a. Surface preparation, priming and number of coats of paint specified are in addition to shop priming and surface treatment specified under other sections of the work.

4. The term "paint" as used herein means all coating systems materials, which includes pretreatments, primers, emulsions, epoxies, enamels, varnish, stain, sealers, fillers, and other applied materials whether used as prime, intermediate or finish coats.

5. The Contractor shall paint all exposed surfaces whether or not colors are designated in any schedule, except where the natural finish of the material is specifically noted as a surface not to be painted.

    a. The term "exposed" as used herein means all items not covered with concrete, plaster, fireproofing or similar material.

    b. Where items or surfaces are not specifically mentioned, the contractor shall paint these the same as adjacent similar materials or areas.

    c. Structural and miscellaneous metals covered with concrete, plaster, or similar material shall only receive a primer compatible with the covering material.

6. Pipe markers shall be in conformance with Agency requirements and Section 15051, at no additional cost to Agency, whether or not such requirements are shown on the Drawings.

    a. Direction regarding pipe markers shall be provided by the Agency.

B. Coordination:

1. The Contractor shall review installation procedures under other Sections and coordinate the installation of items that must be field painted in this Section.

2. The Contractor shall coordinate the painting of areas that will be inaccessible once equipment has been installed.

3. The Contractor shall provide finish coats that are compatible with the prime paints used.

    a. Contractor shall review other Sections of these Specifications in which prime paints are to be provided to ensure compatibility of the total coatings system for the various substrates.

    b. Contractor shall be responsible for the compatibility of all shop primed and field painted items in this Contract.

    c. The Contractor shall furnish information on the characteristics of the finish materials proposed for use, to ensure that compatible prime coats are used.

    d. Barrier coats shall be provided over incompatible primers or primers shall be removed and re-primed as required.

C. The following categories of work are not part of the field-applied finish work:

1. Shop priming of structural metal, miscellaneous metal fabrications, other metal items and such fabricated components as shop-fabricated or factory-built heating and ventilating, and electrical equipment or accessories shall conform to applicable requirements of this Section.

    a. Contractor shall meet the requirements of other appropriate Sections of this Specification.

2. Pre-Finished Items: Unless otherwise shown or specified, painting shall not be included when factory finishing such as baked-on enamel, porcelain, polyvinylidene fluoride or other similar finish is specified for such items including, but not limited to, acoustic materials, finished mechanical and electrical equipment such as light fixtures and distribution cabinets.

    a. Contractor shall be required to touch up factory finished items with paint supplied by the item manufacturer.

    b. Contractor shall field paint damaged pre-finished items as directed by the Agency.

c. Where a factory finished coating is applied to an item which is not specified to receive a factory finish coat, acceptance of the factory finish coat shall be at the discretion of the Agency.

d. The color of pre-finished materials shall be noted with the equipment submittals.

3. Concealed Surfaces:

a. Unless otherwise shown or specified, painting is not required on nonmetallic wall or ceiling surfaces concealed from view areas and in generally inaccessible areas, such as furred areas, pipe spaces, duct shafts and elevator shafts.

b. All piping, equipment, and other such items within these areas that are not galvanized or coated with another corrosion resistant coating as specified shall be painted according to this Section.

4. Concrete floors covered with tile, concrete topping or similar products and exposed concrete floors and exterior walkways/slabs shall not be painted.

5. Metal surfaces of stainless steel, chromium plate, and similar finished materials will not require finish painting, unless shown or specified.

6. Operating Parts and Labels:

a. Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts do not require finish painting unless otherwise specified.

b. The Contractor shall not paint over any code-required labels, such as UL and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

c. All paint, coating or splatter inadvertently placed on these surfaces shall be removed.

1.06 QUALITY ASSURANCE

A. Products manufactured by one of the following companies or a company that the Agency accepted equal, shall be provided:

1. Carboline Company, Incorporated.

2. Tnemec Company, Incorporated.

3. ICI DeVoe Coatings, Incorporated

4. International Protective Coatings

5. Dudick, Incorporated

B. Applicator Qualifications:

1. The name and experience record of the painting applicator shall be submitted.

a. List the utility or industrial installations painted; responsible officials, architects, or engineers concerned with the project; include the approximate contract price.

b. The applicator shall have a minimum of five utilities or industrial installations of a similar size or larger, all in California within the last five years.

c. Painting applicators whose submissions indicate that they have not had the experience required to perform the Work will not be approved.

C. All paint and coating products for a specified coating system shall be supplied by the same manufacturer unless otherwise approved.

1. The Coating Manufacturer shall be the primary source of information for all coatings supplied.

PART 2 - PRODUCTS

2.01 MATERIAL QUALITY

A. Provide the best grade of the various types of coatings suitable for use in waste water treatment plants, water treatment plants, pumping stations and resource recovery plants. Coatings regularly manufactured by acceptable paint material manufacturers shall be provided.

1. Material not displaying the manufacturer's identification as a standard, best-grade product will not be acceptable.

B. Primers produced by the same manufacturer as the finish coats shall be provided.

1. Use only thinners recommended by the paint manufacturer, and use only to recommended limits.

2. The Agency approval shall be obtained prior to thinning any material.

C. Paints and pipe markers of durable and washable quality shall be provided. Materials that will withstand normal washing as required for removing grease, oil, chemicals, etc., without showing discoloration, loss of gloss, staining, or other damage shall be used.

D. The Contractor shall only use coating materials suitable for the intended use and recommended by the manufacturer for the intended service.

2.02 PRODUCT DELIVERY, STORAGE AND HANDLING

A. All materials shall be delivered to the job site in original, new and unopened packages and containers bearing the manufacturer's name and label, and the following information.

1. Name or title of material.

2. Manufacturer's stock number and date of manufacture.

3. Manufacturer's name.

4. Contents by volume, for major pigment and vehicle constituents.

5. Thinning instructions where recommended.

6. Application instructions.

7. Color name and number.

B. Storage of Materials:

1. Only acceptable project materials shall be stored on project site.

2. The Contractor shall store coating products in a suitable location approved by the Agency. The area shall be kept clean and accessible.

3. Storage shall be restricted to paint materials and related equipment.

4. Health and fire regulations shall be complied with, including the Occupational Safety and Health Act of 1970.

5. Coatings and painting materials shall be stored according to manufacturer's recommendations including product shelf life and recommended storage temperature.

2.03 SUBSTITUTIONS

A. No substitutions of manufacturer or coating system shall be allowed that decrease the film thickness, the number of coats, the surface preparation or the generic type of coating specified.

1. Approved substitute manufacturers must furnish the same color selection as the manufacturers specified, including accent color in all coating systems.

2.04 COLORS AND FINISHES

A. Surface treatments, and finishes, are shown under "Painting Systems" in Part 2.05.

1. All substrates scheduled under "Painting Systems" shall be painted whether or not shown on the Drawings, or in Schedules, unless an item is specifically scheduled as not requiring the painting system.

B. Consult with Agency for color selection.

C. The Contractor shall submit to the Agency an itemized schedule of the surfaces to be painted.

1. After approval of submittals and prior to beginning work, the Agency will note on the schedule the selected color to be furnished.

D. In general, all color coding of piping, ducts and equipment shall comply with applicable standards of ANSI A13.1 and OSHA 1910.144.

E. Representative colors shall be used when preparing samples for the Agency review.

1. Final acceptance of colors will be from samples applied on the job.

F. Color pigments shall be pure, non-fading, applicable types to suit the substrates and service indicated.

1. Lead content shall not exceed amount permitted by federal, state and local government laws and regulations.

2. Paints specified for application on submerged concrete or metal in contact with potable water shall be approved by the California State Department of Health Services.

G. All painting systems specified are based on brush application.

1. Other mechanical techniques shall be submitted to the Agency for approval before these application techniques may be reflected in any paint schedules submitted by the Contractor.

a. Submit proof of acceptability, of technique proposed, by the paint manufacturer selected.

2.05 PAINTING SYSTEMS

A. The following index lists the various painting and coating systems by service and generic type. The systems are specified in detail in the paragraphs that follow. Mil thicknesses shown are minimum dry-film thickness. If proper installation of the coating system requires a more stringent surface

preparation than is specified herein, comply with manufacturer's requirements at no additional cost to Agency.

No.	Title	Generic Coating
Submerged Ferrous Metal Coating Systems		
1.	Submerged Ferrous Metal, Raw Wastewater or Raw Water (Nonpotable)	Epoxy
2.	Submerged Metal, Secondary Treated Wastewater	Epoxy
3.	Submerged Metal, Potable or Nonpotable Water	Epoxy
Exposed Ferrous Metal Coating Systems		
11.	Exposed Ferrous Metal, Interior Exposure, Corrosive Environment	Epoxy (three coat system)
12.	Exposed Ferrous Metal, Corrosive Environment	Epoxy with polyurethane topcoat
13.	Exposed Ferrous Metal, Exterior Exposure/Atmospheric Weathering	Epoxy with polyurethane topcoat
Concrete and Masonry Coating Systems		
31.	Exposed Concrete and Masonry, Corrosive Environment	Vinyl Ester
Coating Systems for Nonferrous Metals		
51.	Aluminum Insulation from Concrete and Carbon Steel	Epoxy

B. System No. 1 – Submerged Ferrous Metal, Raw Wastewater or Raw Water (Nonpotable):

1. Type: Epoxy.

2. Service Conditions For use with metal pipes or structures alternately submerged in raw wastewater or raw water (nonpotable) and exposed to a moist saturated hydrogen sulfide atmosphere.

3. Surface Preparation: SSPC SP-10.

4. Product and Manufacturer: One of the following, or Agency approved equal, shall be provided:

   a. Carboline Company:

      (1) Primer: Carboguard 890 -- 1 coat, 3.0 to 5.0 dry mils.

      (2) Field Touchup: Carboguard 890 -- 1 coat, 3.0 to 5.0 dry mils.

      (3) Intermediate: Carboguard 890– 1 coat 4.0 to 6.0 dry mils.

      (4) Finish: Carboguard 890 -- 1 coat, 4.0 to 6.0 dry mils.

   b. Tnemec Company:

      (1) Primer: Series V69, Epoxoline II– 1 coat, 3.0 to 5.0 dry mils.

      (2) Field Touchup: Series V69, Epoxoline II – 1 coat, 3.0 to 5.0 dry mils.

      (3) Intermediate: Series V69, Epoxoline II – 1 coat, 4.0 to 6.0 dry mils.

(4) Finish: Series V69, Epoxoline II -- 1 coat, 4.0 to 6.0 dry mils.

c. ICI Paint--DeVoe:

(1) Primer: Bar-Rust 235V – 1 coat, 4.0 to 6.0 dry mils; or

(2) Primer (Shop Coated): Devran 201H – 1 coat, 4.0 to 6.0 dry mils

(3) Field Touchup: Bar-Rust 235V – 1 coat, 4.0 to 6.0 dry mils.

(4) Intermediate: Bar-Rust 235V – 1 coat, 4.0 to 6.0 dry mils.

(5) Finish: Bar-Rust 235V – 1 coat, 4.0 to 6.0 dry mils.

d. Exposed ductile iron pipe, interior and exterior, shall be shipped to the site without the standard asphaltic coating, but with a primer coat suitable for use with this coating system.

C. System No. 2 – Submerged Ferrous Metal, Secondary Treated Wastewater:

1. Type: Epoxy.

2. Service Conditions For use with structures, valves, piping, or equipment immersed in potable or nonpotable water.

3. Surface Preparation: SSPC SP-10.

4. Product and Manufacturer: One of the following, or Agency approved equal, shall be provided:

a. Carboline Company:

(1) Primer: Carboguard 890 -- 1 coat, 3.0 to 5.0 dry mils.

(2) Field Touchup: Carboguard 890 -- 1 coat, 3.0 to 5.0 dry mils.

(3) Intermediate: Carboguard 890– 1 coat 4.0 to 6.0 dry mils.

(4) Finish: Carboguard 890 -- 1 coat, 4.0 to 6.0 dry mils.

b. Tnemec Company:

(1) Primer: Series V69, Epoxoline II– 1 coat, 3.0 to 5.0 dry mils.

(2) Field Touchup: Series V69, Epoxoline II – 1 coat, 3.0 to 5.0 dry mils.

(3) Intermediate: Series V69, Epoxoline II – 1 coat, 4.0 to 6.0 dry mils.

(4) Finish: Series V69, Epoxoline II -- 1 coat, 4.0 to 6.0 dry mils.

c. ICI Paint--DeVoe:

(1) Primer: Bar-Rust 233H – 1 coat, 4.0 to 6.0 dry mils; or

(2) Primer (Shop Coated): Devran 201H – 1 coat, 4.0 to 6.0 dry mils

(3) Field Touchup: Bar-Rust 235V – 1 coat, 4.0 to 6.0 dry mils.

(4) Intermediate: Bar-Rust 235V – 1 coat, 4.0 to 6.0 dry mils.

(5) Finish: Bar-Rust 235V – 1 coat, 4.0 to 6.0 dry mils.

d. Exposed ductile iron pipe, interior and exterior, shall be shipped to the site without the standard asphaltic coating, but with a primer coat suitable for use with this coating system.

D. System No. 3 – Submerged Ferrous Metal, Potable or Nonpotable Water:

1. Type: Epoxy.

2. Service Conditions For use with structures, valves, piping, or equipment immersed in potable or nonpotable water.

3. Surface Preparation: SSPC SP-10.

4. Additional Requirements: NSF-61 certified (Potable Water)

5. Product and Manufacturer: One of the following, or Agency approved equal, shall be provided:

   a. Carboline Company:

      (1) Primer: Carboguard 890 -- 1 coat, 3.0 to 5.0 dry mils.

      (2) Field Touchup: Carboguard 890 -- 1 coat, 3.0 to 5.0 dry mils.

      (3) Intermediate: Carboguard 890– 1 coat 4.0 to 6.0 dry mils.

      (4) Finish: Carboguard 890 -- 1 coat, 4.0 to 6.0 dry mils.

   b. Tnemec Company:

      (1) Primer: Series V69, Epoxoline II– 1 coat, 3.0 to 5.0 dry mils.

      (2) Field Touchup: Series V69, Epoxoline II – 1 coat, 3.0 to 5.0 dry mils.

      (3) Intermediate: Series V69, Epoxoline II – 1 coat, 4.0 to 6.0 dry mils.

      (4) Finish: Series V69, Epoxoline II -- 1 coat, 4.0 to 6.0 dry mils.

   c. ICI Paint--DeVoe:

      (1) Primer: Bar-Rust 233H – 1 coat, 4.0 to 6.0 dry mils; or

      (2) Primer (Shop Coated): Devran 201H – 1 coat, 4.0 to 6.0 dry mils

      (3) Field Touchup: Bar-Rust 235V – 1 coat, 4.0 to 6.0 dry mils.

      (4) Intermediate: Bar-Rust 235V – 1 coat, 4.0 to 6.0 dry mils.

      (5) Finish: Bar-Rust 235V – 1 coat, 4.0 to 6.0 dry mils.

   d. Exposed ductile iron pipe, interior and exterior, shall be shipped to the site without the standard asphaltic coating, but with a primer coat suitable for use with this coating system.

E. System No. 11 - Ferrous Metals including Structural Steel, Miscellaneous Metals and Ferrous Piping (e.g. steel or ductile iron) - Interior Exposure (i.e. inside a building or vault) - Corrosive Environment.

1. Type: Epoxy, 3-coat system.

2. Shop Surface Preparation: SSPC-SP 6 Commercial Blast as specified in Part 3.03.

3. Field Surface Preparation: Sandblasting of field welds and other imperfections. The Agency may require all areas to be blasted at its discretion, SSPC-SP 6, commercial blast as specified in Part 3.03.

4. Surface Preparation per Manufacturer: If proper installation of the coating system requires a more stringent surface preparation than is specified herein, comply with manufacturer's requirements at no additional cost to Agency.

5. Product and Manufacturer: One of the following, or Agency approved equal, shall be provided:

   a. Carboline Company:

      (1) Primer: Carboguard 890 -- 1 coat, 3.0 to 5.0 dry mils.

      (2) Field Touchup: Carboguard 890 -- 1 coat, 3.0 to 5.0 dry mils.

      (3) Intermediate: Carboguard 890– 1 coat 4.0 to 6.0 dry mils.

      (4) Finish: Carboguard 890 -- 1 coat, 4.0 to 6.0 dry mils.

b. Tnemec Company:

(1) Primer: Series V69, Epoxoline II– 1 coat, 3.0 to 5.0 dry mils.

(2) Field Touchup: Series V69, Epoxoline II – 1 coat, 3.0 to 5.0 dry mils.

(3) Intermediate: Series V69, Epoxoline II – 1 coat, 4.0 to 6.0 dry mils.

(4) Finish: Series V69, Epoxoline II -- 1 coat, 4.0 to 6.0 dry mils.

c. ICI Paint--DeVoe:

(1) Primer: Bar-Rust 235V – 1 coat, 4.0 to 6.0 dry mils; or

(2) Primer (Shop Coated): Devran 201H – 1 coat, 4.0 to 6.0 dry mils

(3) Field Touchup: Bar-Rust 235V – 1 coat, 4.0 to 6.0 dry mils.

(4) Intermediate: Bar-Rust 235V – 1 coat, 4.0 to 6.0 dry mils.

(5) Finish: Bar-Rust 235V – 1 coat, 4.0 to 6.0 dry mils.

6. This system shall be used for all exposed interior ferrous metal and walls as shown or scheduled, including, but not limited to, interior exposed steel or ductile iron pipe.

a. Exposed ductile iron pipe, interior and exterior, shall be shipped to the site without the standard asphaltic coating, but with a primer coat suitable for use with this coating system.

F. System No. 12 - Ferrous Metals including Structural Steel, Miscellaneous Metals and Ferrous Piping (e.g. steel or ductile iron) – Corrosive Environment.

1. Type: Epoxy with Polyurethane finish coat, 3-coat system.

2. Shop Surface Preparation: SSPC-SP 6 Commercial Blast as specified in Part 3.03.

3. Field Surface Preparation: Sandblasting of field welds and other imperfections. The Agency may require all areas to be blasted at its discretion, SSPC-SP 6, commercial blast as specified in Part 3.03.

4. Surface Preparation per Manufacturer: If proper installation of the coating system requires a more stringent surface preparation than is specified herein, comply with manufacturer's requirements at no additional cost to Agency.

5. Products and Manufacturer: One of the following, or Agency approved equal, shall be provided:

a. Carboline Company:

(1) Primer: Carboguard 890 -- 1 coat, 3.0 to 5.0 dry mils.

(2) Field Touchup: Carboguard 890 -- 1 coat, 3.0 to 5.0 dry mils.

(3) Intermediate: Carboguard 890 -- 1 coat, 4.0 to 6.0 dry mils.

(4) Finish: Carbothane 134 VOC-- 1 coat, 3.0 to 5.0 dry mils.

b. Tnemec Company:

(1) Primer: Series V69, Epoxoline II -- 1 coat, 3.0 to 5.0 dry mils.

(2) Field Touchup: Series V69, Epoxoline II – 1 coat, 3.0 to 5.0 dry mils.

(3) Intermediate: Series V69, Epoxoline II -- 1 coat, 4.0 to 6.0 dry mils.

(4) Finish: Series 1095, Endura-Shield -- 1 coat, 3.0 to 5.0 dry mils.

c. ICI Paint--DeVoe:

(1) Primer: Bar-Rust 235V– 1 coat, 4.0 to 6.0 dry mils; or

(2) Primer (Shop Coated): Devran 201H – 1 coat, 4.0 to 6.0 dry mils

(3) Field Touchup: Bar-Rust 235V– 1 coat, 4.0 to 6.0 dry mils.

(4) Intermediate: Bar-Rust 235V– 1 coat, 4.0 to 6.0 dry mils.

(5) Finish: Devthane 379H Polyurethane – 1 coat, 3.0 dry mils (minimum).

6. This system shall be used for all exposed exterior ferrous metal and walls as shown or scheduled, including, but not limited to, exterior exposed ductile iron or steel pipe.

a. Exposed ductile iron pipe, interior and exterior, shall be shipped to the site without the standard asphaltic coating, but with a primer coat suitable for use with this coating system.

G. System No. 13 - Ferrous Metals including Structural Steel, Miscellaneous Metals and Ferrous Piping (e.g. steel or ductile iron) - Exterior Exposure (outdoors, with or without overhead cover; not immersed).

1. Type: Epoxy with Polyurethane finish coat, 3-coat system.

2. Shop Surface Preparation: SSPC-SP 6 Commercial Blast as specified in Part 3.03.

3. Field Surface Preparation: Sandblasting of field welds and other imperfections. The Agency may require all areas to be blasted at its discretion, SSPC-SP 6, commercial blast as specified in Part 3.03.

4. Surface Preparation per Manufacturer: If proper installation of the coating system requires a more stringent surface preparation than is specified herein, comply with manufacturer's requirements at no additional cost to Agency.

5. Products and Manufacturer: One of the following, or Agency approved equal, shall be provided:

a. Carboline Company:

(1) Primer: Carboguard 890 -- 1 coat, 3.0 to 5.0 dry mils.

(2) Field Touchup: Carboguard 890 -- 1 coat, 3.0 to 5.0 dry mils.

(3) Intermediate: Carboguard 890 -- 1 coat, 4.0 to 6.0 dry mils.

(4) Finish: Carbothane 134 VOC-- 1 coat, 3.0 to 5.0 dry mils.

b. Tnemec Company:

(1) Primer: Series V69, Epoxoline II -- 1 coat, 3.0 to 5.0 dry mils.

(2) Field Touchup: Series V69, Epoxoline II – 1 coat, 3.0 to 5.0 dry mils.

(3) Intermediate: Series V69, Epoxoline II -- 1 coat, 4.0 to 6.0 dry mils.

(4) Finish: Series 1095, Endura-Shield -- 1 coat, 3.0 to 5.0 dry mils.

c. ICI Paint--DeVoe:

(1) Primer: Bar-Rust 235V– 1 coat, 4.0 to 6.0 dry mils; or

(2) Primer (Shop Coated): Devran 201H – 1 coat, 4.0 to 6.0 dry mils

(3) Field Touchup: Bar-Rust 235V– 1 coat, 4.0 to 6.0 dry mils.

(4) Intermediate: Bar-Rust 235V– 1 coat, 4.0 to 6.0 dry mils.

(5) Finish: Devthane 379H Polyurethane – 1 coat, 3.0 dry mils (minimum).

6. This system shall be used for all exposed exterior ferrous metal and walls as shown or scheduled, including, but not limited to, exterior exposed structural steel framing, ductile iron pipe or steel pipe.

a. Exposed ductile iron pipe, interior and exterior, shall be shipped to the site without the standard asphaltic coating, but with a primer coat suitable for use with this coating system.

H. System No. 31 – Exposed Concrete, Corrosive Environment (Chemical Storage Area)

1. Type: 100% solids vinyl ester or epoxy primer, 100% solids vinyl ester or epoxy-graphite reinforced basecoat, fiberglass mat reinforcement intermediate layer, aluminum oxide filled vinyl or epoxy topcoat, and aliphatic polyurethane finish coat. Vinyl ester basecoat/topcoat shall be used for sodium hypochlorite or citric acid exposure. Epoxy basecoat/topcoat shall be used for sodium bisulfate exposure. System shall be suitable for accidental splashing, spilling or containment of citric acid, sodium bisulfate and/or sodium hypochlorite in chemical storage and unloading areas.

2. Surface Preparation per Manufacturer: Comply with manufacturer's requirements.

3. Products and Manufacturer: One of the following, or Agency approved equal, shall be provided:

a. Ceilcote 6640 Ceilcrete by International Protective Coatings:

(1) Prime Coat: 380 Primer -- 1 coat, 3.0 to 5.0 dry mils.

(2) Basecoat: 6640 Ceilcrete – 1 coat, 25 sq. ft. per gallon.

(3) Intermediate Reinforcing Mat: 1-ounce chopped fiberglass strand mat.

(4) Intermediate Saturant Coat: 6640 Ceilcrete – 1 coat, 60 sq. ft. per gallon.

(5) Topcoat: 6640 Ceilcrete – 1 coat, 60 to 70 sq. ft. per gallon.

(6) Total System dry-film thickness: 125 mils

b. Ceilcote 242 Flakeline by International Protective Coatings:

(1) Prime Coat: 380 Primer -- 1 coat, 3.0 to 5.0 dry mils.

(2) Basecoat: 242 Flakeline – 1 coat, 25 sq. ft. per gallon.

(3) Intermediate Saturant Coat: 242 Flakeline – 1 coat, 60 sq. ft. per gallon.

(4) Topcoat: 242 Flakeline – 1 coat, 60 to 70 sq. ft. per gallon.

(5) Total System dry-film thickness: 125 mils

c. Proteco-Line 800 by Dudick:

(1) Prime Coat: Primer 27 -- 1 coat, 3.0 to 5.0 dry mils.

(2) Basecoat: Protecto-Line 800 – 1 coat, 25 sq. ft. per gallon.

(3) Intermediate Reinforcing Mat: 1-ounce chopped fiberglass strand mat.

(4) Intermediate Saturant Coat: Protecto-Line 800 – 1 coat, 60 sq. ft. per gallon.

(5) Topcoat: Protecto-Line 800 – 1 coat, 60 to 70 sq. ft. per gallon.

(6) Finish coat: Sealer 30 -- 1 coat, 5.0 dry mils.

(7) Total System dry-film thickness: 125 mils

4. This system shall be used for all exposed concrete surfaces at chemical storage areas.

I. System No. 51 - All Aluminum in Contact with Dissimilar Materials:

1. Surface Preparation: remove all foreign matter. If proper installation of the coating system requires a more stringent surface preparation than is specified herein, comply with manufacturer's requirements at no additional cost to Agency.

2. Product and Manufacturer: One of the following, or Agency approved equal, shall be provided:

   a. Carboline Company:

      (1) Primer: Rust-Bond -- 1 coat, 1.0 to 2.0 dry mils.

      (2) Finish: Carboguard 890 -- 1 coat, 3.0 to 5.0 dry mils.

   b. Tnemec Company:

      (1) Primer: Series V69, Epoxoline II -- 1 coat, 3.0 to 5.0 dry mils.

      (2) Finish: V69, Epoxoline II -- 1 coat, 3.0 to 5.0 dry mils

   c. ICI Paint--DeVoe:

      (1) Primer: Devran 203 – 1 coat, 3.0 to 5.0 dry mils per coat; or

      (2) Finish: Devran 224HS – 1 coat, 3.0 to 5.0 dry mils.

PART 3 - EXECUTION

3.01 JOB CONDITIONS

A. Existing Conditions:

1. Before painting is started in any area, it shall be broom cleaned and excessive dust shall be removed.

2. After painting operations begin in a given area, broom cleaning will not be allowed; cleaning shall then be done only with commercial vacuum cleaning equipment.

3. The Contractor shall adequately protect all existing structures from new painting splatters and overspray.

   a. The Contractor shall thoroughly clean all accidental spills, splatters, and overspray.

   b. Any damage stains to finishes, equipment, or concrete shall be restored to original condition to the Agency's satisfaction.

B. Environmental Requirements:

1. Water-based paints shall be applied only when the temperature of surfaces to be painted and the surrounding air temperatures are between 55 °F and 90 °F unless otherwise permitted by the paint manufacturer's printed instructions.

2. Other paints shall be applied only when the temperature of the surfaces to be painted and the surrounding air temperatures are between 65 °F and 95 °F, unless otherwise permitted by the paint manufacturer's printed instructions.

3. Paint shall not be applied in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or to damp or wet surfaces unless specifically permitted by the manufacturer's printed instructions.

4. Painting may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and heated within the temperature limits specified by the paint manufacturer during application and drying periods, and there is no danger of condensation on the surfaces being painted.

5. Adequate illumination and ventilation shall be provided in all areas where painting operations are in progress.

6. Final piping markers shall be installed only after all painting and finish Work has been completed to the Agency's satisfaction.

C. Finished Work of other trades and surfaces not being painted concurrently or not to be painted shall be covered or otherwise protected.

D. Contractor shall be responsible for air monitoring, confined space training, and personal protection equipment in accordance with the Agency's safety requirements. Contractor shall furnish a safety plan prior to commencing work.

3.02 INSPECTION

A. The Contractor and his applicator shall examine the areas and conditions under which painting work is to be performed and notify the Agency in writing of conditions detrimental to the proper and timely completion of the Work.

1. The Contractor shall not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Agency.

B. The Contractor shall not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to the formation of a durable paint film.

C. The Contractor shall maintain an accurate written record of the coatings used each day.

1. A copy of this record shall be furnished to the Agency at the close of each working day.

2. This record shall list: coating manufacturer's product number, amount of each coating in gallons used in the day, component ratio of mixed paints and any approved thinning procedures, and amount of excess mixed paint left over at the end of each day.

3.03 SURFACE PREPARATION

A. General:

1. All preparation and cleaning procedures shall be performed as specified herein and in strict accordance with the paint manufacturer's instructions for each particular substrate and atmospheric condition.

2. All hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish painted shall be removed or provided surface applied protection prior to surface preparation and painting operations.

a. The Contractor shall remove, if necessary, for the complete painting of the items and adjacent surfaces.

b. Following completion of painting of each space or area, the removed items shall be reinstalled by work persons skilled in the trades involved.

3. Surfaces to be painted shall be cleaned before applying paint or surface treatments.

a. Oil and grease shall be removed with clean cloths and cleaning solvents prior to mechanical cleaning.

b. The cleaning and painting shall be programmed so that dust and other contaminants from the cleaning process will not fall in wet, newly painted surfaces.

4. All surfaces which were not shop painted or which were improperly shop painted, and all abraded or rusted shop painted surfaces, which are to be painted, as determined by the Agency, shall be prepared as specified below.

B. Galvanized Surfaces:

1. The Contractor shall clean free of oil and surface contaminants with solvent or other methods recommended by the coating manufacturer, complying with SSPC-SP 1.

2. Submerged or intermittently submerged galvanized ferrous metal, interior and exterior, shall be cleaned of all oil, grease, dirt, mill scale and other foreign matter by a brush-off blast cleaning complying with SSPC-SP 7 with one mil profile minimum.

C. Ferrous Metals:

1. Non-Immersed ferrous surfaces, including structural steel and miscellaneous metal to be shop primed, shall be cleaned of all oil, grease, dirt, mill scale and other foreign matter by commercial blast cleaning complying with SSPC-SP 6.

2. Immersed ferrous surfaces, including structural steel and miscellaneous metal to be shop primed, shall be cleaned of all oil, grease, dirt, mill scale and other foreign matter by near-white blasting complying with SSPC-SP 10.

3. Buried ferrous metals shall first be cleaned of visible deposits of oil, grease, and other organic contaminates by using a solvent wash complying with SSPC SP1, followed by near-white blasting complying with SSPC SP10.

   a. The temperature of the substrate shall be 5 degrees F above the dew point temperature.

4. Non-Immersed, ferrous surfaces that have not been shop-coated shall be cleaned of all oil, grease, dirt, loose mill scale and other foreign substances by commercial blasting, complying with SSPC-SP 6.

5. Immersed ferrous surfaces that have not been shop-coated or that, in the opinion of the Agency, have been improperly shop-coated, shall be cleaned of all oil, grease, dirt, mill scale and other foreign matter by near-white blasting complying with SSPC-SP 10.

6. Bare and blasted or pickled clean metal shall be treated with metal treatment wash coat, prior to priming only if recommended by the paint manufacturer.

7. Shop applied prime coats which have damaged or bare areas shall be touched-up with primer recommended by the coating manufacturer after commercial blasting complying with SSPC-SP 6.

3.04 MATERIALS PREPARATION

A. General:

1. Painting materials shall be mixed and prepared in strict accordance with the manufacturer's written directions.

2. Coating materials produced by different manufacturers shall not be mixed, unless otherwise permitted by the manufacturer's instructions.

3. Materials not in actual use shall be stored in tightly covered containers.

   a. Containers used in storage, mixing, and application of paint shall be maintained in a clean condition, free of foreign materials and residue.

4. All materials shall be stirred before application to produce a mixture of uniform density, and as required during the application of the materials.

    a. Any film that may form on the surface shall not be stirred into the material.

    b. The film shall be removed and, if necessary, the material shall be strained before using.

B. Each undercoat shall be tinted a lighter shade to facilitate identification of each coat where multiple coats of the same material are to be applied.

1. Undercoats shall be tinted to match the color of the finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

2. A code number shall be provided to identify material tinted by the manufacturer.

C. Mixing:

1. The Contractor shall mix only in mixing pails placed in a suitably sized non-ferrous or oxide resistant metal pans to protect concrete floor from splashes or spills which could stain exposed concrete or react with subsequent finish floor material.

    a. Contractor shall thoroughly clean all accidental spills and any damage to finish or concrete shall be restored to original condition to the Agency’s satisfaction.

2. Paint shall be mixed and applied only in containers bearing accurate product name of material being mixed or applied.

3.05 APPLICATION

A. General:

1. Paint shall be applied by brush.

2. Other mechanical application techniques such as roller, air spray, or airless spray in accordance with the manufacturer's directions and recommendations of Paint Application Specifications No. 1 in SSPC Vol. 2, where applicable, shall be used only when approved by the Agency.

3. Brushes best suited for the type of material being applied shall be used.

4. Where approved by the Agency, rollers of carpet, velvet back, or high pile sheep's wool shall be used, as recommended by the paint manufacturer for material and texture required.

5. The number of coats and paint film thickness required is the same regardless of the application method.

6. Succeeding coats shall not be applied until the previous coat has completely dried per the Manufacturer's recommendation.

7. Additional coats shall be applied when undercoats, stains, or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance.

    a. This is of particular importance regarding intense primary accent colors.

    b. The Contractor shall insure that all surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a film thickness equivalent to that of flat surfaces.

8. Surfaces not exposed to view do not require color coding but require the same coating systems specified for exposed surfaces.

9. "Exposed to view surfaces" are defined as those areas visible when permanent or built-in fixture, convector covers, covers for finned tube radiation, grilles, etc., are in place in areas scheduled to be painted.

10. The backs of access panels and removable or hinged covers shall be painted to match the exposed surfaces.

11. Exterior doors on tops, bottoms, and side edges shall be finished the same as the exterior faces.

12. Aluminum parts in contact with dissimilar materials shall be painted as specified with appropriate finish.

13. Temporarily remove pipe clamps and hangers prior to painting installed pipe.

B. Heating, Ventilating, Air Conditioning and Electrical Work:

1. Heating, ventilating, and air conditioning items to be painted include, but are not limited to, the following:

a. Piping, pipe hangers, and supports.

b. Ductwork and insulation.

c. Motors, mechanical equipment, and supports.

d. Accessory items

2. Electrical items to be painted include, but are not limited to, the following:

a. Conduit and fittings.

b. Switchgear, panels, junction boxes, motor control centers, motors and accessories.

C. The Contractor shall apply each material at not less than the manufacturer's recommended spreading rate, and provide total dry film thickness as specified.

1. Extra coats shall be applied if required to obtain specified total dry film thickness.

D. Scheduling Painting:

1. The first-coat material shall be applied to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

2. Sufficient time between successive coatings shall be allowed to permit proper drying.

a. The Contractor shall not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and the application of another coat of paint does not cause lifting of loss of adhesion of the undercoat.

E. Primed and sealed walls and ceilings shall be recoated where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects caused by insufficient sealing.

F. The Contractor shall completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage.

G. Brush Application:

1. All brush coats shall be brushed-out and worked onto the surfaces in an even film.

a. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

b. All glass and color break lines shall be neatly drawn.

2. All primer or first coats shall be brush applied, unless otherwise permitted to use mechanical applicators.

H. Mechanical Applicators:

1. Mechanical methods shall be used for paint application when permitted by governing ordinances, paint manufacturer, and approved by the Agency.

a. If permitted, it shall be limited to only those surfaces impracticable for brush applications.

2. Roller applications, if approved by the Agency, shall be limited to interior wall and ceiling finishes for second and third coats.

a. Each roller coat shall be applied to provide the equivalent hiding as brush-applied coats.

3. Spray application shall be confined to metal framework, siding, decking, wire mesh and similar surfaces where hand brush work would be inferior and to other surfaces specifically recommended by the paint manufacturer.

4. Wherever spray application is used, each coat shall be applied to provide the equivalent hiding of brush-applied coats.

a. Do not double back with spray equipment for the purpose of building up film thickness of 2 coats in one pass.

I. The Contractor shall match approved samples for color, texture and coverage to completed work:

1. Work not in compliance with specified requirements shall be removed, refinished or repainted, as required by the Agency.

J. Piping markers shall be applied in accordance with the manufacturer's written instructions at locations specified in Section 15051.

3.06 FIELD QUALITY CONTROL

A. The right is reserved by the Agency to invoke the following material testing procedure at any time, and any number of times during the period of field painting:

1. Engage the service of an independent testing laboratory to sample any of the paint being used.

a. Samples of materials delivered to the project site will be taken, identified and sealed, and certified in the presence of the Contractor.

b. The testing laboratory will perform appropriate tests for any or all of the following characteristics: Abrasion resistance, apparent reflectivity, flexibility, washability, absorption, accelerated weathering, dry opacity, accelerated yellowness, recoating, skinning, color retention, alkali resistance and quantative material analysis.

c. If the test results show that the material being used does not comply with the specified requirements, the Contractor may be directed to stop the painting Work.

d. Remove the non-complying paint; pay for testing; and repaint surfaces coated with the rejected paint.

e. Remove rejected paint from previously painted surfaces if, upon repainting with the specified paint, the two coatings are non-compatible.

B. Prior to initial coat and after completion of each successive coat of paint, the Contractor shall notify the Agency.

1. After inspection, checking of film thickness and approval by the Agency, proceed with the succeeding coat.

C. The Contractor shall supply the Agency for its use a Gardner dry-film thickness gage.

3.07 PROTECTION

A. Work of other trades shall be protected, whether to be painted or not, against damage by the painting and finishing work.

1. All such work shall be left undamaged.

2. All damage shall be corrected by cleaning, repairing or replacing, and repainting, as acceptable to the Agency.

B. "Wet Paint" signs shall be provided as required to protect newly painted finishes.

1. All temporary protective wrapping provided for protection of this Contract shall be removed after completion of painting operations.

3.08 CLEAN-UP

A. During the progress of the Work, all discarded paint materials, rubbish, cans and rags shall be removed from the site at the end of each work day.

B. Upon completion of painting work, all paint-spattered surfaces shall be cleaned.

1. Spattered paint shall be removed by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

C. At the completion of work of other trades, all damaged or defaced painted surfaces shall be touched-up and restored, as determined by the Agency.

3.09 PAINTING AND COATING SCHEDULE

A. Contactor shall provide a painting and coating systems schedule.

1. This schedule is not intended to be exhaustive, but to provide general requirements for painting and coating work for approval by the Agency.

2. Contractor is responsible for take-offs, quantities, and all requirements shown on the drawings, and specified herein.

B. Stainless Steel:

1. Protect stainless steel members, hardware, etc. from painting work.

2. Remove any overspray or spills on stainless steel surfaces.

END OF SECTION

SECTION 10401

SIGNAGE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Signs

1.02 REGULATORY REQUIREMENTS

A. Conform with OSHA Section 1910.145 of Subpart J, part 1910, Chapter XVII, Title 29 of the Code of Federal Regulations.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Subject to compliance with the Contract Documents, the following Manufacturers are acceptable:

2.02 MATERIALS

A. Signs: enameled steel.

B. Color: coordinate color schemes with Owner's Representative.

2.03 SIGNS

A. Design:

1. Sign lettering: single stroke
2. Color: contrast in color with the background.
3. International symbols: Use international symbols for those messages for which there are international symbols.
4. Chain mounted signs: Provide lettering on both sides for chain mounted signs.

B. Size: Sign size shall be as follows unless shown otherwise in plans:

1. A: 14 inch x 20 inch
2. B: 10 inch x 14 inch
3. C: 7 inch x 10 inch
4. D: 3 inch X 12 inch

C. Type:

Type	Size	Message
I	B	Caution - Automatic equipment may start at any time
II	D	480 Volts
III	B	Corrosive chemical
IV	B	No smoking
V	B	Emergency eyewash and safety shower
VI	B	Keep out
VII	B	Lock out switch before working on equipment
VIII	B	Trip main breaker inside building prior to working on transformer
IX	B	Non-Potable Water - Do Not Drink
X	B	Fire Extinguisher

PART 3 - EXECUTION

3.01 GENERAL

A. Provide in locations as specified and as directed by the Owner Representative.

B. Mount signs as specified and as directed by the Owner Representative.

C. Provided signs according to the following schedule:

Type	Application
I	All automatic equipment and valves
II	All 480 Volt electrical equipment and panels (new)
III	Chemical area and injection locations
IV	Not applicable
V	Eyewash
VI	Not applicable
VII	All new lock-out stop switches
VIII	Not applicable
IX	All new plant water hose bibs and fixtures
X	Not applicable

END OF SECTION

SECTION 11001

GENERAL EQUIPMENT PROVISIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. General equipment provisions, in general, for all equipment furnished under this contract including equipment specified in other sections.

B. This specification shall supplement the individual equipment specifications.

1. In case of conflict the individual equipment specifications shall govern.
2. All interpretations of conflict shall be to the Owner's sole judgment.
3. The Contractor shall be responsible for ensuring that all sub-contractors and suppliers or venders have reviewed all requirements of equipment furnished and installed under Division 11.

1.02 RELATED REQUIREMENTS

A. Section 01300, Submittal Procedures;

B. Section 01660, Installation, Testing and Commissioning;

C. Section 01720, Instructions of Operations and Maintenance Personnel;

D. Section 01730, Record Drawings;

E. Section 02050, Demolition;

F. Section 05220, Concrete Bolts;

G. Section 09900, Painting and Coating;

H. Section 10401, Signage.

I. Section 11700, Magnetic Flow Meter;

J. Section 16222, Motors.

1.03 REFERENCES

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

AGMA American Gear Manufacturer's Association

ANSI American National Standards Institute

ASCE American Society of Civil Engineers

ASME American Society of Mechanical Engineers

ASTM American Society for Testing and Materials

AWS American Welding Society

AWWA American Water Works Association

AFBMA Anti-Friction Bearing Manufacturer's Association

Cal/OSHA California Division of Occupational Safety and Health

CBC California Building Code

CMC California Mechanical Code

HI Hydraulic Institute

IEEE Institute of Electrical and Electronic Engineers

IPCEA Insulated Power Cable Engineer's Association

NACE National Association of Corrosion Engineers

NEC National Electric Code

NEMA National Electrical Manufacturer's Association

NFPA National Fire Protection Association

NSF National Sanitation Foundation

OSHA Federal Occupational Safety and Health Act

SSPC Steel Structures Painting Council, American National Standards Institute

SSPWC Standard Specifications for Public Works Construction ("Greenbook")

UBC Uniform Building Code

UL Underwriters Laboratory

1.04 SUBMITTALS

A. All submittals shall be submitted in accordance with Section 01300, “Submittal Procedures.”

B. Submit the following for each item of equipment:

1. Deviation from Specification: A copy of this specification section with all addenda and all referenced specification sections shall be submitted, with each paragraph check-marked by the Manufacturer to indicate specification compliance or marked to indicate deviations from the specification requirements. Failure to include the required specification sections and the justification for deviations will indicate non-compliance and shall be rejected without further consideration.

    a. Check marks shall indicate complete compliance with the paragraph requirements.

    b. Deviations from the specification shall be indicated by underlining the deviation and marking the paragraph or line with a number or letter. The remainder of the paragraph not marked as a deviation shall indicate compliance with the requirements of the paragraph.

    c. The Manufacturer shall prepare a detailed justification for each deviation.

2. References: Submit references as required by the paragraph of this specification entitled "Manufacturer's Qualifications."

3. Anchor Bolt Calculations and Drawings:

    a. Anchor bolt seismic and wind design calculations and drawings for each piece of equipment shall be submitted.

    b. All anchor bolt seismic and wind design calculations and drawings shall be stamped and signed by a Registered Civil Engineer in the State of California. Calculations shall demonstrate that equipment bolting, mounting, and anchoring meets requirements of the California Building Code considering site-specific seismic criteria.

4. Shop Drawings:

    a. Dimensions, elevations, and materials for all equipment and/or components covered in this specification

    b. Installation and layout of equipment and appurtenances

    c. Anchoring details for all equipment signed and sealed by a registered Civil Engineer in the State of California

    d. Detailed field assembly drawings

    e. Details of support members

    f. Field connection locations

    g. Total equipment weight and lifting points

    h. Drawings showing sizes and location for all wiring connecting to external devices. Number all terminal blocks.

    i. Controls and wiring diagrams:

        (1) Wiring diagrams of all electrical and control components

        (2) Method of anchoring control panels, and electrical connection details sufficient to permit design of supportive structures and connections

5. Factory Test Results:

    a. Certified equipment and motor test data.

    b. Copies of torsional and critical speed analysis (only for variable speed devices).

6. Field Test Results: Submit all results of field tests.

7. Spare Parts: Submit a list of the spare parts to be provided.

8. Operation and Maintenance Data: Submit Operations and Maintenance Manuals in accordance with Section 01300.

9. Installation and Start-up Instructions: Submit written installation and start-up instructions.

10. Warranty Information: Submit all guarantee and warranty information described in the Paragraph entitled "Warranty."

11. Manufacturer's Certification and Reports:

    a. Obtain a written certification from the Manufacturer that the Manufacturer guarantees the equipment units being furnished will meet or exceed the performance criteria specified in the Performance Criteria paragraph of the applicable specification.

b. Provide all manufacturer's certification and reports required in Part 1 of this Section.

c. Report on field tests including vibration tests.

d. For variable speed machines only, provide certification from the manufacturer of the driven equipment that the variable frequency drive being supplied is appropriate for the control of the motor and equipment being furnished.

12. Manufacturer's Field Report: All field data collected by the Manufacturers or Manufacturer's representative of the equipment during start-up services, where required in the Specifications, shall be submitted by the Contractor to the Owner within fourteen (14) days after the start-up services are complete.

a. The test and field data shall be submitted whether specified or not in the detailed equipment specifications and shall include but not be limited to tolerance and alignment measurements where applicable to certify equipment has been satisfactorily installed, and all other information collected by the Manufacturers/Suppliers to satisfy themselves that equipment has been properly installed.

b. In cases where the Manufacturers/Suppliers believe equipment is not properly installed, Manufacturers and Suppliers shall include with this submittal a punch list detailing the problems noted.

13. Alternative System Design: In the event that the Contractor proposes to furnish a mechanical system that requires significant modifications to the mechanical layout on the Drawings, Contractor shall submit revised mechanical, electrical, and structural layout from the system supplier that shows the revised piping, conduit, and support plans. Revised plan shall show detailed dimensions and material call-outs. Revised layouts will not be considered acceptable until approved by the Owner.

14. Pump Data: Submittals for pumping equipment shall include the following:

a. Pump performance curves showing head vs. capacity at varying speeds, efficiency, brake horsepower, and NPSHR.

(1) The Manufacturer shall indicate by arrows to points on the H/Q curves the limits recommended for stable operation, between which the pumps are to be operated to prevent surging, cavitation, and vibration.

(2) The stable operating range shall be based on actual hydraulic and mechanical characteristics of the units.

b. Specific Speed of Pump

c. Required inlet submergence

d. Torque and thrust from shut-off head to minimum head conditions

e. Data on pump losses including column and discharge head hydraulic friction losses and horsepower required for shaft friction and thrust bearings

f. Minimum and Maximum rotative speed of pumps

g. Seal type and materials

h. Type, manufacturer and model numbers of bearings

i. Bearing life calculations

j. Coupling Data

k. Pressure Limitations

l. Pump Can Sizing

(1) The Pump Manufacturer shall perform calculations and submit the required minimum pump can dimensions to maintain velocities within the can and submergence on the pump impeller in accordance with Hydraulic Institute Standards

(2) The Pump Manufacturer shall review the pump can shop drawings prior to fabrication and provide a certification stating that the can dimensions conform to their recommendations

15. Motor Data: Submittals for motors shall include the following:

a. For each motor furnish a certified motor data sheet for the actual motor or for a previously manufactured electrically duplicate motor which was tested. Provide the following minimum data:

(1) Speed-torque relationship

(2) Efficiency at 1/2, 3/4 and full load

(3) Power factor at 1/2, 3/4 and full load

(4) Slip at full load

(5) Running light, full load and locked rotor current

(6) Temperature rises and results of dielectric tests

(7) Type and frame size

(8) Bearing type and lubrication medium

(9) Insulation and enclosure type

(10) Safe running time-current curves

b. All Electric Motors shall also have the following submitted:

(1) Name of Manufacturer

(2) Motor Horsepower

(3) Full load speed

(4) Design letter

(5) Temperature rise and class of insulation system

(6) Service factor

(7) Voltage, frequency, number of phases

16. Thrust Bearing Data, where applicable: Type, specification, lubricant specification, maximum applied load, capacity, bearing load and life (minimum) at rated speed and shut-off head.

17. Protective Coating Data: Submittals for equipment supplied with protective coatings shall include product data sheets, color charts, and safety data sheets.

18. Gear Reducer Data: Submittals for equipment with gear reducers shall include service factor, efficiency, torque rating, and materials of construction for all gear reducers.

19. Lubrication Data: Submittals for equipment with lubrication shall include

a. Lubrication requirements

b. Recommended lubrication manufacturer and product

20. Equipment Control Panel Data: Submittals for equipment supplied with control panels shall include:

    a. Control descriptions, schematics, and diagrams for control panel

    b. Material spec sheets for pilot device, wiring, and appurtenances

    c. Layout

    d. Control sequence description

21. Torsional and Critical Speed Analysis: Where specified in individual equipment specifications, Torsional and Critical Speed Analysis shall include:

    a. Contractor shall retain manufacturer of driven equipment to perform vibration and critical frequency analysis of all pumping unit components to demonstrate compliance with requirements defined in the Conditions of Operation. Analysis shall include but not be limited to the natural resonance of the motors (coupled and uncoupled to the shaft) equipment shafts, pump/equipment head, pump/equipment columns, and pump/equipment base.

    b. The analysis shall demonstrate that the driven units will not be subject to harmful vibrations at any point on the equipment operating curve during start-up, shutdown, and normal operating speed(s) ranging from the minimum operating speed as identified in the equipment specifications and the maximum operating speed as identified in the equipment specifications.

1.05 SPARE PARTS

A. Furnish the spare parts identified in the individual specification sections.

B. All spare parts shall be individually packaged with detailed itemized inventory list with part numbers, parts descriptions, and pricing.

C. Spare parts shall be paid for separately within the schedule of values and delivery and shall be delivered to and signed by the Owner's warehouse agent.

D. Refer to Section 01760, "Spare Parts and Maintenance Materials" for additional requirements.

1.06 QUALITY ASSURANCE

A. Manufacturer Experience Qualifications:

1. Experience in manufacturing equipment of the same size or larger to the equipment and motors specified

2. Meet the following installation requirements, unless otherwise specified in the individual specifications:

    a. Minimum number of equipment installed and in operation:

        (1) Location: United States of America

        (2) Facility type: Wastewater

        (3) Size: Substantially similar to specified equipment

        (4) Minimum duration of operation: Five years

B. Regulatory Requirements: It shall be the Contractor's responsibility to meet all safety and electrical codes and to provide all equipment, appurtenances and specialty items required to provide for complete and operable systems.

C. Certifications:

1. Obtain a written certification from the Manufacturer that the Manufacturer guarantees the equipment units being furnished will meet or exceed the performance criteria specified in the Performance Criteria paragraph of the applicable specification.

2. For each piece of VFD driven equipment, the Contractor shall have the responsibility for the satisfactory operation of the entire system including driven equipment, motors, variable frequency drives, and controls as specified by the Contract Documents. The Contractor shall submit an acceptance letter from the driven equipment and motor manufacturers stating that the VFDs will fully meet all starting and operating requirements of each driven equipment/motor combination. The Contractor shall submit a letter from the VFD manufacturer stating that they have reviewed the driven equipment requirements and that the VFD will successfully meet all operating requirements of all driven equipment. VFD model number, motor model number, and driven equipment model number shall be specifically listed in each letter. The Contractor shall be responsible for coordinating all motor amperage requirements with the amperage ratings of each VFD.

D. Equipment Quality

1. All equipment shall be designed, fabricated and assembled in accordance with the best modern engineering and shop practice and in accordance with applicable standards including ASTM, ANSI and AMA.

2. Individual parts shall be manufactured to standard sizes and gauges so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units, shall be interchangeable. Equipment shall not have been in service at any time prior to delivery, except as required for tests.

3. All parts and components of mechanical equipment shall be designed for satisfactory service under continuous duty without undue wear under the specified and indicated operating conditions for the period of time specified in these Documents. Any part of mechanical equipment that shows undue or excessive wear or fails due to wear under normal operating conditions within the warranty period shall be considered as evidence of defective material or defective workmanship, and it shall be replaced by the Contractor with equipment or parts to meet the specified requirements at no cost to the Owner.

4. All equipment specified herein shall be new and of current manufacturer. The equipment furnished shall be designed and constructed in accordance with the best practices and methods and shall operate satisfactorily when installed as shown on the Drawings and operated per the Manufacturer's recommendations. All workmanship and materials used shall be of the highest quality and of proven reliability. All equipment furnished under this Section shall be of a design and manufacture that has been used in similar applications and it shall be demonstrated to the satisfaction of the Owner that the quality is equal to equipment made by that Manufacturer specifically named therein.

E. Unit responsibility:

1. Equipment or systems made up of two or more components shall be provided as a working unit by the responsible manufacturer (unit responsibility manufacturer). The unit responsibility manufacturer shall coordinate selection, design and shall provide all

mechanical components, including local control panels such that all equipment components furnished under the equipment specification and the contract drawings for the equipment assembly, and all components specified elsewhere but referenced in the equipment assembly specification, is compatible and operates reliably and properly to achieve the specified performance criteria. Unless otherwise indicated, the Contractor shall obtain each system from the supplier of the driven equipment, which supplier shall provide all components of the system to enhance compatibility, ease of construction and efficient maintenance. The Contractor is responsible to the Owner for performance of all systems as indicated here and in the specific Specification references and contract drawings. The unit responsibility manufacturer is designated in the individual equipment specifications found in these contract documents.

2. All components complete with motors and all other specified accessories and appurtenances shall be furnished by the Equipment Manufacturer to ensure coordination, compatibility, integrity, operation of the individual components and system, and provide the specified warranty for all components. The Equipment Manufacturer shall be the source of information on all equipment furnished.

1.07 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be boxed, crated, or otherwise completely enclosed and protected during shipment, handling, and storage. Each container or piece of equipment shall be clearly marked with the Contractor's name, project name and location.

B. Deliver materials to the site to ensure uninterrupted progress of the work. Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete in ample time not to delay that work.

C. Handle all equipment and materials very carefully. Protection and maintenance of materials and equipment stored on the jobsite shall be the sole responsibility of the Contractor. The Contractor shall protect and exercise all stored materials and equipment in strict accordance with the manufacturer's recommendations and as instructed by the Owner. Damaged equipment and materials will not be acceptable. Any loss, or damage to stored materials or equipment shall be the responsibility of the Contractor. The Contractor shall replace missing or damaged materials or equipment at the Contractor's expense. All Owner furnished equipment after unloading by the Contractor shall be the sole responsibility of the Contractor and shall be installed and maintained by the Contractor as specified herein.

D. The Contractor shall store and temporarily support equipment prior to installation in strict accordance with the Manufacturer's recommendations and instructions. Equipment shall be stored on raised supports protected from exposure to the elements and shall be kept thoroughly dry at all times. Pumps, motors, drives, electrical equipment, and other equipment having anti-friction or sleeve bearings shall be stored in weathertight storage facilities such as warehouses. Covering with visquine or similar material will not be considered as a weathertight enclosure. All material and equipment shall be covered or stored in a manner which will prevent entry of deleterious matter.

E. Protect all exposed surfaces. Protect all equipment from being contaminated by dust, dirt, vibration and moisture. Protect all bolt threads, etc. from damage and corrosion.

F. Finished surfaces of all exposed flanges shall be protected by wooden blank flanges, strongly built and securely bolted thereto.

G. Protect all factory applied coatings from damage during shipment, unloading, storage and installation. Painted surfaces shall be protected against impact, abrasion, discoloration and other damage. Painted equipment surfaces that are damaged prior to acceptance shall be repainted in entirety to the satisfaction of the Owner.

H. Power cables and control panels shall be covered and stored in a manner which will protect them from dirt, moisture, and abrasion.

I. Electrical equipment, controls, and isolation shall be protected against moisture or water damage. Temporarily connect equipment with built in space heaters to a power source and keep heaters in operation.

J. Rotate all shafts that have bearings on at least a monthly basis.

K. The contractor shall be responsible for work, equipment, and materials until inspected, tested and finally accepted. Keep records of the storage parameters and the dates that storage procedures were performed.

L. After hydrostatic or other tests, all entrapped water shall be drained from equipment and appurtenances prior to shipping, and proper care shall be taken to protect parts from the entrance of water during shipment, storage and handling.

1.08 SITE CONDITIONS

A. Outdoor, in corrosive environment, with temperature range of 32° Fahrenheit to 110° Fahrenheit, unless otherwise specified in the individual related equipment specifications.

1.09 WARRANTY

A. The Contractor shall guarantee all equipment against (a) faulty or inadequate design, (b) improper assembly or erection, (c) defective workmanship or materials, and (d) leakage, breakage, or other failures. The guarantee period shall be as specified herein and in the detailed equipment specifications.

B. For all equipment, the Contractor shall obtain from the equipment Manufacturer a warranty for all motors, controls, and appurtenances

1. Warranty period: One year from the date of Final Acceptance, unless otherwise specified in the individual specification sections.

2. During the warranty period, the Contractor shall provide the services of a trained manufacturer's representative to make all adjustments, repairs and replace all defective material and equipment at no cost to the Owner.

3. The Contractor shall include all costs incurred by the manufacturer, including travel and expenses, under the terms of the warranty.

C. The Manufacturer shall guarantee that the equipment is suitable for the project site conditions and will meet or exceed the performance criteria specified in the individual specifications.

1. A written certification of the performance criteria guarantee from the Manufacturer shall be submitted.

2. In the event the performance criteria are not met, the Manufacturer shall make all modifications or additions required to bring the equipment into compliance at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer's name and catalog numbers are for the convenience of the Contractor. The detailed specifications shall apply in the event of a conflict. If detailed specifications have not been given, the Manufacturer's name and catalog number shall determine the design criteria for comparison should an equal be submitted.

B. Substitutions and Adaptations:

1. Equipment shall be readily adaptable for installation and operation as shown on the plans. No responsibility for alteration of a planned structure to accommodate other types of equipment shall be assumed by the Owner. Equipment which requires alteration of the structures shall be considered only if the Contractor assumes all responsibility for costs associated with design changes including, but not limited to, engineering design, production of plan revisions, and verification of equality to specified equipment. All such alterations, including required engineering reviews by the Engineer of Record, shall be made at the Contractor's expense.

2. Equipment approved as being of equal quality, performance, integrity, etc., may be used in place of that specified. Any revisions to structures, piping, electrical or other work made necessary by such substitution is subject to review by the Engineer. All costs associated with such revisions, including engineering and administration costs, shall be paid by the Contractor. The Owner shall be the sole judge of equivalency. Any revisions to structural, piping, electrical or other work made necessary from deviations from approved submittals shall be paid by the Contractor including engineering and administration costs.

2.02 PERFORMANCE CRITERIA

A. General Requirements:

1. All equipment shall be able to operate continuously 24 hours per day, seven days per week, for a 12 -month period with minimal servicing and maintenance.

2. Materials shall be suitable for the service conditions to be encountered.

3. All mechanisms or parts shall be amply proportioned for the stresses which may occur during operation or for any other stresses which may occur during fabrication, erection, and transportation.

4. Equipment input power requirements shall not exceed the motor nameplate brake horsepower at any point on the equipment operating curve from shutoff to runout.

B. Pumps:

1. Pump characteristic curves shall continuously rise from minimum head to shutoff with no intermediate dips.

2. Pumping units shall be designed for continuous stable operation at all points on their operating curves from shut-off to run-out head at all speeds between the minimum specified speed and the maximum specified speed.

C. Machine Unit Vibration Requirements (for variable speed machines only):

1. Equipment shall be designed so there are not damaging vibrations or lateral or torsional critical speeds, or abnormal noise at any point on the operating curve from shutoff to run-out head at all operating speeds.

2. The vibration of the installed equipment shall comply with the recommended limits defined in ANSI/HI 2.4, latest edition. Contractor shall perform tests to confirm compliance with vibration limits.

3. If the installed equipment experiences vibration exceeding the Hydraulic Institute limits, equipment manufacturer shall modify equipment components as necessary to correct the deficiencies, at no additional cost to the Owner.

2.03 EQUIPMENT, GENERAL

A. Equipment Piping and Valve Components:

1. See requirements in Division 15

2. All flanges on equipment and appurtenances furnished shall conform in dimensions and drilling to ANSI B16.1, Class 125 unless otherwise specified.

B. Equipment Electrical Components: see requirements in Division 16

C. Equipment Instrumentation and Control Components: see requirements in Division 13

D. Metals:

1. Unless otherwise specified, structural steel shall conform to ASTM A36.

2. Unless otherwise specified, all materials shall conform to the structural and miscellaneous standards of the American Institute of Steel Construction.

3. All steel bars, shapes, and plates shall be clean and straight before being worked. Straightening or flattening, if necessary, shall be done by a process and in a manner that shall not injure the metal. Sharp kinks or bends shall be cause for rejection. Steel that has been heated partially shall be annealed, unless it is to be used in minor parts. Finished members shall be true to line and free from twists, bends, and other joints.

4. Bronze which shall be in contact with water or any liquid, used in the manufacture of any equipment shall not contain aluminum nor more than 6 percent zinc, and shall conform to ASTM B62, or equivalent.

2.04 BEARINGS

A. Unless otherwise specified, all equipment bearings shall be oil or grease lubricated, ball or roller antifriction type of standard manufacture. Bearings shall be conservatively designed to withstand all stresses of the service specified. Each bearing, except as otherwise noted, shall be rated in accordance with the latest revisions of Anti-Friction Bearing Manufacturer's Association's (AFBMA) Methods of Evaluating Load Ratings of Ball and Roller Bearings for B-10 rating life of 100,000 hours.

B. All grease lubricated bearings, except those specified to be factory sealed lubricated, shall be fitted with easily accessible grease supply, flush, drain and relief fittings of the standard hydraulic type. Extension tubes shall be provided for easy access.

C. Oil lubricated bearings shall be equipped with either a pressure lubricating system or a separate oil reservoir type system. Each oil lubrication system shall be of sufficient size to safely absorb the heat energy normally generated in the bearing under a maximum ambient temperature of 50 degrees C and shall be equipped with a filler pipe and an external level gauge. Fittings for pressure lubrication shall be 1/4-inch straight-type.

D. To avoid work hardening or "Brinelling" damage from vibration, bearings shall be separately packed or otherwise suitably protected during transport.

E. Thrust Bearings (where applicable) shall have AFBMA rated (minimum) life of not less than five years when operated continuously at highest rated speed of motor and at total load consisting of the weight of the motor rotor plus combined dead weight and hydraulic thrust load imposed on motor by equipment, when equipment is operating at shutoff head. (Average life is five times minimum life). Bearings shall be adequate to carry thrust Loads existing under all conditions of equipment operation from shutoff to run-out.

2.05 MOTORS

A. Refer to Section 16222, “Motors” for requirements.

2.06 LUBRICATION AND LUBRICATION FITTINGS

A. Equipment shall be adequately lubricated by systems which require attention no more often than weekly during continuous operation. Lubrication systems shall not require attention during start-up or shutdown and shall not waste lubricants. Lubricants of the type recommended by the equipment manufacturer shall be provided in sufficient quantity for consumption prior to completion of required testing and acceptance of equipment by the Owner. The Contractor shall provide the Owner, prior to equipment start-up, four (4) copies of a list showing the proper lubricants for each item of mechanical equipment, approximate quantities needed per year of continuous operation, and recommended lubrication intervals. Wherever possible, the types of lubricants shall be consolidated with the manufacturer's approval to minimize the number of different lubricants required for plant maintenance.

B. Equipment lubrication fittings shall be extended with piping beyond obstructions such as guards or covers to provide ease of lubrication without disassembly of the unit.

C. All lubrication fittings shall be constructed of 304 L stainless steel and shall be brought to the outside of all equipment so they are readily accessible from the outside without the necessity of removing covers, plates, housing, or guards. Fittings shall be of button head type. Lubrication fittings shall be mounted together wherever possible and shall be made of factory-mounted multiple fitting assemblies. Fittings shall not be individual fittings field-mounted together.

2.07 ACCESSORIES

A. Anchor Bolts:

1. 316L stainless steel
2. Refer to Section 05220, “Concrete Bolts”.

3. Design anchoring and bolting systems for all equipment, unless such designs are shown or specified.

B. Fasteners: All fasteners supplied with equipment shall be 316L stainless steel.

C. Pressure Gauges: Except where permanent pressure gauges are shown on the plans, a 1/2" NPT connection and 316 stainless steel isolation cock shall be furnished and installed on the suction and discharge piping of all pumps. Unless connections are provided on the pump casing at the suction and discharge, the connections shall be provided immediately upstream of the pump suction connection and immediately downstream of the pump discharge connection. All gauges shall be furnished per Division 13 "Instrumentation and Control Requirements". NPT connection shall be furnished and installed on the suction and discharge piping of all pumps, immediately upstream of the pump suction connection and immediately downstream of the pump discharge connection.

D. Equipment Nameplates

1. The equipment manufacturers shall provide equipment nameplates for each equipment item and shall be fastened to the equipment in an accessible location.

2. The nameplate shall include manufacturer's name and contact information, equipment model number, identification tag number, shop order number, drive speed, motor horsepower, and rated capacity, and date of manufacture. Nameplates for pumps shall also include rated total dynamic head and impeller size where applicable.

3. Equipment nameplates shall be stamped on stainless steel and fastened to the equipment with No. 4 or larger oval head stainless steel screws or drive pins.

E. Identification Plates

1. The Contractor shall furnish and install identification plates and shall mount on or adjacent to each item of equipment and device including tanks, gates, motor operated valves, electrical and instrumentation items and all other mechanical equipment items.

2. The identification plates shall identify the equipment function, title, equipment number, and Owner asset number bar code.

3. Identification plates shall be approximately 1-inch by 3-inches made from phenolic material having a black exterior and white center. Letters shall be engraved and shall not be smaller than 3/16-inch high. All plates shall be fastened with 316 stainless steel pins or screws as approved by the Owner. The plates shall be supplied by a single Manufacturer.

4. The Contractor shall be responsible for compiling a list of all equipment titles and equipment numbers (where required by the Contract Documents) as they will appear on the identification plates. The Contractor shall submit the list of titles along with a sample identification plate to the Owner for review.

F. Warning Signs: The Contractor shall furnish and install permanent warning signs and shall mount them at all mechanical equipment which may be started automatically or from remote locations. Signs shall be as per Section 10401.

G. Guards: Belt or chain drives, fan blades, couplings, exposed shafts and other moving or rotating parts shall be covered on all sides by safety guards which conform to the General Industry Safety Orders of the California Division of Industrial Safety. Safety guards shall be fabricated from 15 USS gauge or heavier 316 stainless steel. Each guard shall be designed for easy installation and removal. Necessary supports and accessories shall be provided for each guard. Safety guards in

outdoor locations shall be designed to prevent the entrance of rain and dripping water. Drawings of safety guards shall be submitted to the Owner for approval prior to fabrication or delivery.

H. Control Cabinets and Panels: where located outdoors or in corrosive environments, provide minimum NEMA 4X enclosures unless otherwise specified or noted on the Contract Drawings or in the Specifications.

2.08 FINISHES

A. Painting.

1. Refer to Section 09900, “Painting and Coating” for requirements.

B. Galvanizing.

1. Galvanizing shall conform to the applicable requirements of Section 210-3 "Galvanizing" of the Standard Specifications for Public Works Construction, latest edition.

2.09 SOURCE QUALITY CONTROL

A. The equipment shall be factory assembled and factory tested prior to being shipped to ensure satisfactory operation.

B. The Engineer and/or Owner may, at their option and own expense, witness the factory testing by reporting intent to do so to the Contractor. The Contractor shall notify the Owner in writing, at least fourteen (14) calendar days prior to testing by the Manufacturer. The written notifications shall specify the exact date and location the tests shall be conducted, and all testing shall be performed during normal working hours.

C. The following, but not limited to, individual components of the equipment shall be factory tested:

1. Equipment unit
2. Motor
3. Control Panel and Instrumentation

D. (For pumps) Pump Shop Tests:

1. Pump columns, discharge heads, volutes, and bowl assemblies shall be hydrostatically tested to twice the design total head or one-and-a-half times the shut-off head, whichever is greater.
2. Each pump shall be operated from zero to maximum capacity. Results of the tests shall be shown in a plot of test curves showing bowl head, total head, flow, pump input power, net positive suction head required, pump efficiency, and pump efficiency at design running speed(s). Recording and computation of test results shall be in accordance with AWWA E102 or E103 as applicable. Readings shall be taken at a minimum of 5 evenly spaced capacity points including shutoff, design point, minimum and maximum head for which pump is designed to operate.
3. When specified in the individual pump specification section, the test shall be witnessed by a registered Professional Engineer, who may be an employee of the manufacturer. The engineer shall sign and seal all copies of curves and test reports and shall certify that hydrostatic tests were performed. Test shall be conducted in conformance with the methods described in the Hydraulic Institute Standards. The pump manufacturer shall notify the Owner, in writing, at least fourteen (14) calendar days prior to testing. The

written notifications shall specify the exact date and location the tests will be conducted, and shall define the test procedures to be utilized. Testing shall be performed during normal working hours.

4. Pumps shall not be shipped until the Owner has approved all test reports.

E. Test tolerances for rate of flow, total head, power, and efficiency shall meet Acceptance Grade 1U as specified in ANSI/HI 11.6 or 14.6.

F. Motor Shop Tests (for all motorized equipment):

Each motor shall be given a short commercial test to demonstrate that it is free from defects and to provide assurance that it meets specified requirements. Tests shall include as a minimum:

a. No load running current and current balance

b. Locked rotor current

c. Winding resistance

d. High potential test

e. Bearing inspection

f. Vibration test

2. When specified in the individual equipment specification section, the test shall be witnessed by a registered Professional Engineer; who may be an employee of the manufacturer. The engineer shall sign and seal all copies of curves and test reports. The equipment manufacturer shall notify the Owner, in writing, at least fourteen (14) calendar days prior to testing. The written notifications shall specify the exact date and location the tests will be conducted and shall define the test procedures to be utilized. Testing shall be performed during normal working hours.

3. Motors shall not be shipped until the Owner has approved the test reports.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Contractor shall field verify existing conditions for new equipment installed on or adjacent to existing structures. Submit this info to equipment manufacturer for fabrication of sole plates and all other devices attached to existing structures.

B. The Contractor shall take all measurements for his work at the installation sites, verify all subcontractor's and Manufacturer's drawings and be responsible for the proper installation within the available space of the apparatus specified and shown on the drawings and must inform the Owner of any variations and shall submit all proposed changes for review before making any changes.

3.02 INSTALLATION

A. General Requirements:

1. Installation of equipment shall be in accordance with the Manufacturer's written recommendations.

2. Skilled craftsmen experienced in installation of the equipment or similar equipment shall be used. Applicable specialized tools and equipment, such as precision machinist levels, dial indicators, and gauges shall be utilized as required in the installations. The work shall be accomplished in a workmanlike manner to produce satisfactory equipment installation free of vibration or other defects.

3. Install in a manner and to the tolerances recommended by the equipment manufacturer. The Contractor shall obtain installation instruction booklets or other recommendations from the equipment manufacturers as to procedures for, sequence of, and tolerances allowed in equipment installation. In particular, the Manufacturer's recommendations as to grout spaces required, type of grout to be used, and tolerances for level and alignment, both vertical and horizontal, shall be obtained and followed. One (1) copy of this material shall be given to the Owner prior to the installation of the equipment.

4. Whenever applicable, the Contractor shall obtain the services of a Manufacturer's representative specifically trained in erection of his equipment to supervise the installation. The Contractor shall be responsible for the proper alignment of all installed driven equipment and drives in accordance with the tolerance recommendation of the manufacturers for both Owner furnished and Contractor furnished equipment.

5. Installation shall include furnishing and applying an initial supply of grease and oil, recommended by the manufacturer.

6. The Contractor shall furnish and install all on-site wiring and piping.

7. Support piping independent of equipment.

8. Check and align unit components.

9. Make all electrical connections in conformance with requirements of Division 16, Electrical.

10. Plug all taps and orifices not required for equipment operation and controls.

11. Install Type 316 stainless steel pipe or tubing on each pump to convey leakage to nearest drainage inlet.

12. The Contractor shall install all Owner furnished equipment where required by the Contract Documents, in accordance with the installation instructions, shop drawings and submittals provided by the equipment manufacturers and available at the Owner offices for the Contractor's use.

13. Prior to installation of equipment, all sacking and concrete preparation shall be completed and the work area shall be maintained in a broom-clean condition during the equipment installation.

B. Existing Facility Tie-In Connections

1. The Contractor shall provide at least seven (7) days written notice of all work that shall tie into existing facilities. The method(s) used to tie into existing facilities shall be reviewed by the Owner prior to execution of the work. All costs associated with tie-ins shall be included with the Contractor bids.

C. Equipment Pads

1. Concrete Foundation: Unless otherwise specified or noted on the Contract Drawings, all equipment shall be provided with a reinforced concrete pad consisting of

   a. Eight (8) inch thick slab with a minimum of #4 re-bars at 8 inches on centers each way

b. 316 stainless steel anchor bolts as required to accommodate the equipment.

2. Equipment Bases:

a. A heavy cast iron or welded steel base shall be provided for each item of equipment that is to be installed on a concrete base.

b. Bases shall be provided with machined support pads, tapered dowels for alignment of mating or adjacent items, adequate openings to facilitate grouting, and openings for electrical conduits.

c. Seams and contact edges between steel plates and shapes shall be continuously welded and ground smooth.

3. Base Grouting:

a. After assembly and installation on the concrete base, each unit shall be level using a precision level and aligned in place, but not grouted until after the initial fitting and alignment of connecting piping.

b. Each unit shall then be grouted to the concrete base. Each base shall be completely filled with grout. The grout shall extend to the edge of each base and shall be beveled at 45 degrees all around the unit.

c. Grout that is exposed at horizontal surfaces shall be rounded to provide drainage to appropriate points.

d. After grout has set, jacking screws shall be removed and nuts on anchor bolts shall be tightened, followed by an overall check on leveling and alignment.

e. Should equipment not meet tolerances of leveling and alignment, as recommended by the manufacturer, corrective measures shall be taken to obtain the tolerances required.

f. Reciprocating equipment shall be grouted with non-shrinking epoxy grout as manufactured by Embeco, or equal.

D. Anchor Bolts And Jacking Screws

1. All equipment shall be anchored to supporting members by bolts or other connections to accommodate all operating forces and satisfy the seismic restraint requirements of the California Building Code considering site-specific seismic criteria. Anchor bolts and hardware sizes and installation shall conform to the seismic design calculations and drawings submitted to the Owner.

2. Unless otherwise indicated in the individual equipment specifications, the Contractor shall be responsible for furnishing anchoring and bolting systems for the equipment.

3. All anchor bolts and anchoring hardware shall be of Type 316 stainless steel. All fasteners and anchor bolts shall meet the requirements of Specification Section 05500, Miscellaneous Metals.

4. All threaded fasteners shall be coated with a nickel based anti-seize thread lubricant prior to assembly.

5. Alternate methods of anchoring to those shown on the plans and specified herein shall meet the requirements of these Specifications and shall be submitted to the Owner for review. Submittals on alternate anchoring methods shall be done in accordance with Section 01300 and the requirements of this specification section.

6. Seismic design calculations and drawings shall be completed for each equipment item unless anchor sizing, embedment, and spacing for the specific piece of equipment is shown or specified in the Contract Documents. The Contractor shall submit all seismic design calculations and drawings per the requirements of the paragraph of this specification entitled "Submittals." The Contractor shall be responsible for preparing and providing the seismic anchor bolt calculations and drawings for all equipment, unless indicated in the individual equipment specifications that seismic anchor bolt calculations and drawings are to be prepared and provided by the equipment manufacturer or supplier.

7. Jacking screws shall be provided in the heavy equipment bases and where required elsewhere to aid in leveling during installation.

8. Anchor bolt setting drawings shall be delivered sufficiently early to permit setting the anchor bolts when the structural steel support frame is fabricated by others.

9. Where supported on grade, the area under the pad shall be graded and compacted as required prior to placement of the pad. Pads shall not be placed on top of asphalt concrete paving. All asphalt in the pad area including any additional area required for formwork shall be saw cut and removed to grade. The area under the pad shall be graded and compacted as required prior to placement of the pad. Following removal of the forms new asphalt pavement shall be provided around the pad area per Section 02500 of these Specifications.

10. Where pads are required on top of existing concrete slabs, the surface of the existing slab shall be roughened and reinforcing steel shall be doweled into the existing slab prior to forming and placement of the equipment or tank pad.

E. Idler Sprockets

1. Idler sprockets shall be installed so that not less than one-quarter of the total adjustment is available for future use.

F. Painting

1. All exterior surfaces and all interior wetted surfaces shall receive surface cleaning and preparation, prime coat, and applied finish coats as specified in Section 09900.

2. Surfaces requiring painting or coating for corrosion protection shall be smooth, free from sharp edges, burrs, and projections, and shall have all welds ground smooth and all edges and corners of structural members rounded. Non-conformance shall be grounds for rejection of equipment as determined by the Owner.

3. Nameplates shall not be painted.

4. Non-ferrous, stainless steel and moving parts shall not be painted.

5. All ferrous surfaces of equipment, except for machined or bearing surfaces and stainless steel surfaces, shall be cleaned and shop primed. Machined, polished, and other ferrous and non-ferrous surfaces which are not to be painted shall be coated with corrosion and/or rust preventative compound, Dearborn Chemical "NO-Ox-Id", Houghton "Rust Veto 344", Rust-oleum "R9", or approved equal. Should rust occur during shipment and/or storage, the contractor shall be responsible for correction as determined by the Owner.

6. All galvanizing, where called for on the plans and/or the Specifications, shall be hot dip process conforming to ASTM A-123 and the appropriate American Hot Dip Galvanizers Association, Inc. Specifications and the Standard Specifications for Public Works

Construction (SSPWC). Galvanized metal surfaces are to be solvent cleaned of residual oils and primed with an approved galvanized metal primer before shipment.

7. The stainless steel structural components and enclosure panels shall be passivated after fabrication to remove embedded iron, surface rust and weld burn.

8. Copper, bronze, chromium plate, nickel, stainless steel, aluminum, monel metal, lead, lead coated copper, brass and plastic are not to be painted or finished unless called for in other parts of this Specification or on the drawings or as recommended by the manufacturer.

9. Equipment shall be shop primed prior to delivery to the jobsite unless otherwise specified in the Detailed Equipment Specification. Surfaces of equipment that will be inaccessible after assembly shall be painted or otherwise protected before assembly by a method that provides protection for the life of the equipment.

10. All metallic surfaces requiring a shop applied primer shall be primed with an approved priming system that has been verified with the Section 09900 (Painting) subcontractor as being compatible with the Section 09900 coating systems proposed and shall be applied in accordance with the recommendations of the paint manufacturer. Submittals for all equipment specified in Division 11 shall include the following:

    a. Coating manufacturers "Cut-sheet" describing components, surface preparation requirements, recommended mill thicknesses, and application procedures for the proposed primer.

    b. A letter from the equipment supplier stating that he has contacted the Section 09900 (Painting) subcontractor and confirmed that the proposed primers are compatible and that the primer will be applied per the coating manufacturers requirements. In addition, the letter shall certify that the appropriate surface preparations will be made prior to primer application.

11. Date of factory prime coat shall be listed on final Bill of Material with equipment delivery. Field coating shall be completed within the allowable overcoat or recoat time per the coating manufacturer. All surfaces shall be prepared in accordance with coating manufacturer's written recommendations.

12. Electric motors, drives, and other equipment that would be damaged by sandblasting shall be cleaned by hand cleaning or power tool cleaning as directed by the Owner. Following cleaning, the components shall be shop-primed with a rust inhibitive primer and finish coated with a high quality industrial alkyd enamel. The equipment supplier shall certify, by letter included with the equipment submittal, that the Section 09900 (Painting) subcontractor was consulted and confirmed that the proposed primer and finish coating described above is compatible with the approved Section 09900 painting scheme.

13. After delivery to the job site, equipment surfaces shall be inspected and evaluated by the Owner. Touch-up all painted parts that have been damaged during shipping. Touch-up or complete removal of shop priming, by sandblasting or other approved method, may be required as determined by the Owner, based on the condition of the equipment primer prior to final, in place, finish coat application. The Contractor shall furnish brand new equipment to replace any equipment which the Owner determines to be damaged beyond repair by rust or mishandling, etc., while in storage or during installation by the contractor.

14. Field touch-up, final surface preparation, and final finish coatings will be applied by the Section 09900 (Painting) subcontractor.

15. Motors and gear reducers shall be painted the same color.

16. Paint all equipment together with piping after installation to match Owner color code.

G. Dissimilar Metals

1. Where aluminum surfaces come in contact with dissimilar metals, except Type 304 or 316 stainless steel, aluminum surfaces shall be kept from direct contact with said metal by use of neoprene gaskets or washers, polyethylene self-adhesive tape (two wraps of 20-mil tape), or washers. Galvanizing or paint shall not be considered as adequate protection.

2. All stainless steel bolt and screw surfaces in contact with aluminum shall be coated with Never-Seez by Never Seez Compound Corp., or equal.

3.03 SITE TESTS

A. See individual equipment specifications for field test requirements.

B. Contractor shall verify that structures, pipes and equipment are compatible.

C. Make adjustments required to achieve optimum operation.

D. The Contractor shall furnish all labor, materials, equipment and incidentals required to supply, modify, install, test, troubleshoot, and place in satisfactory operation the products, complete with all motors and accessories as applicable, such that it functions automatically in accordance with requirements of the Contract Documents.

E. The equipment shall be field tested after erection in the presence of the Owner and Engineer to confirm and verify the following:

1. Structural and mechanical integrity

2. The equipment operates without jamming, overheating, or vibration

3. Verification of correct equipment and motor rotation

4. The equipment operates in the manner intended and performs the specified functions satisfactorily

5. Compliance with performance criteria in individual equipment specification and with factory performance tests

6. Compliance with vibration limitations

7. Motor and cable insulation for submersible pumps shall be tested for moisture content or insulation defects

8. Demonstrate that the completed installation meets specified requirements and that all controls and safety shutdowns are operational

F. Field test using job supplied flow meters and pressure.

G. Vibration Testing (for variable speed machines only):

1. Provide services of specialist in this field to conduct the tests.

2. Test each installed piece of equipment and motor at each operating speed for compliance with specified vibration and critical frequency limits.

3. Perform bump tests on each pump in each of two orthogonal planes to determine critical frequency.

4. Determine the natural frequency of the support structure at each equipment location by a bump test and an analyzer with a frequency finder.

5. Perform vibration measurements at each operating speed in each of two orthogonal horizontal directions, one of which shall be in the plane of greatest vibration. Modify units and/or dynamic balance, if required to meet specified vibration limits or to correct excessive vibration.

H. The Contractor shall notify the Owner seven (7) days prior to the scheduled day for initial startup.

3.04 MANUFACTURERS' FIELD SERVICES

A. Retain factory trained equipment and motor manufacturer's representatives with demonstrated ability and experience in the installation and operation of the equipment and motors and accessories to perform the services listed below:

1. Pre-Installation Inspection:

   a. Ensure that the equipment shipped to the job-site has been handled according to the manufacturer's recommendations and has arrived in good working order.

   b. Ensure that all equipment has been stored and protected according to the manufacturer's recommendations.

   c. Inspect and verify the structures or surfaces on which the equipment will be installed have no defects which would adversely affect the installation.

   d. The Contractor shall promptly report, in writing, defects which may affect the work to the Owner. A copy of the manufacturer's field report shall be provided to the Owner.

2. Installation:

   a. Provide technical assistance to Contractor during installation of the equipment.

   b. The equipment and motor manufacturers shall check and approve the installation during construction and prior to initial operation.

   c. Check alignment and inspect the installation prior to final grouting and start-up.

   d. Prior to initial start-up, a written statement shall be provided by the manufacturers stating the equipment has been installed by the Contractor in accordance with the Drawings, Specifications and manufacturer's recommendations and is ready to be placed into operation.

3. Startup and Testing:

   a. Assist in initial start-up, adjustments and field testing, including vibration testing.

   b. Be present when the equipment is placed in operation.

   c. The manufacturer shall test operate the system in the presence of the Owner and shall verify the equipment conforms with the specified requirements. The manufacturer shall re-visit the job-site as often as necessary until all deficiencies are corrected and the installation and operation is satisfactory to the Owner.

   d. Perform all tests in the presence of the Owner and the equipment manufacturer's representative.

4. Manufacturer's Field and Test Data Reporting:

a. After installation supervision service by the Manufacturer, the Manufacturer shall submit the following to the Owner within 14 days:

(1) A letter, on the Manufacturer's letterhead, certifying that the equipment was installed per the Manufacturer's recommendations and shall state that the equipment (1) has been properly installed and lubricated, (2) is in accurate alignment, (3) is free from any undue stress imposed by connecting piping or anchor bolts, and (4) has been operated under full load conditions and it operated satisfactorily.

(2) Copies of all test and field data collected by the manufacturers/suppliers of equipment during installation supervision and start-up services including, but not be limited to, the motor amperage readings to verify drives are properly sized, tolerance and alignment measurements where applicable to verify equipment has been satisfactorily installed, and all other information collected by the manufacturers/suppliers to satisfy themselves that equipment has been properly installed. The test and field data shall be submitted whether specified or not in the detailed equipment specifications.

b. In cases where the manufacturer/supplier feels equipment is not properly installed, he shall include with this submittal a punch list detailing the problems noted. The information required under this section shall be furnished for all equipment and devices requiring installation and start-up services as specified in these Specifications including the detailed mechanical, electrical and instrumentation specifications.

c. The costs for this work shall be included in the prices quoted by equipment suppliers. The Contractor shall perform all work required to install and place into operation the equipment in accordance with the manufacturer's recommendations.

d. Acceptance of any report by the Owner shall not relieve the Contractor from his responsibility to meet the requirements of the Contract Documents.

5. Operation and Maintenance Personnel Instruction:

a. Instruct Owner's personnel in the operation and user maintenance of all components in accordance with the requirements of Section 01820, Instruction of Operations and Maintenance Personnel.

b. Each supplier of equipment as required in these Specifications shall provide a qualified manufacturer's representative for a minimum of one 8-hour day to instruct Owner's Operation and Maintenance (O&M) personnel in the operation and maintenance of the equipment furnished unless specified otherwise. Training shall be scheduled within 3 months prior to startup.

c. All costs for the O&M instruction program shall be included in Contractor's Bid.

d. The scheduling of O&M services shall be coordinated with the Owner.

6. Supervise the correction of any defective or faulty Work before and after acceptance by Owner.

B. The installation, testing, and start-up services shall be coordinated with the Owner.

END OF SECTION

SECTION 11312

SUBMERSIBLE MIXER

PART 1 - GENERAL

1.01 MANUFACTURE REQUIREMENTS QUALITY ASSURANCE

A. The mixing equipment specified herein shall be the design and fabrication of a single manufacturer which shall have sole source responsibility for said equipment. The mixer shall be a Flygt 4640 as further discussed in the design documents.

B. The manufacturer shall have mixing equipment of this principal design and of comparable capacity in successful operation in the field for a minimum period of 10 years.

PART 2 - MATERIALS

2.01 MIXER DESIGN

A. The mixer(s) shall be capable of handling raw, screened sewage. The mixer(s) shall be able, with the exception for floor-mounted mixers, to be raised and lowered and shall be easily removed for inspection or service without the need for personnel to enter the mixing vessel.

B. The mixer shall be mounted on a square guide bar system or on a fixed floor mount. A sliding guide bracket shall be an integral part of the mixer unit. The entire weight of the mixer unit shall be guided by a single bracket which must be able to handle all thrust created by the mixer. The standard mixer, with its appurtenances and cable, shall be capable of continuous submergence under water, without loss of watertight integrity, to a depth of 130 ft. FM approved mixers have a depth limit of 57 ft

2.02 MIXER CONSTRUCTION

A. Each mixer shall be of the integral design, close coupled, submersible type. All components of the mixer, including motor, shall be capable of continuous underwater operation. Major mixer components shall be of 316 Stainless Steel construction. The oil housing cover plate shall be of corrosion resistant composite. All exposed fasteners shall be of stainless steel. In order to insure that the low velocity area around the motor remains impervious to low PH solids and or liquid attack, the motor housing exterior shall be made of 316 Stainless Steel. All metal surfaces coming into contact with the mixed media, other than stainless steel, shall be protected by a factory applied epoxy coating on the exterior of the mixer.

2.03 MOTOR (NON-EXPLOSION PROOF)

A. The multi-pole motor shall be directly connected to the propeller (gearbox designs are not acceptable) to produce an adequate propeller speed for the application. The mixer motor shall be squirrel cage, induction, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31. The motor shall be designed for continuous duty, capable

of no less than 30 evenly spaced starts per hours. The rotor bars and short circuit rings shall be made of aluminum.

B. Thermal sensors shall be used to monitor stator temperatures. The stator shall be equipped with three (3) thermal switches embedded in the end coils of the stator winding and set for 284°F (140°C). These shall be used in conjunction with, and supplemental to, external motor overload protection, and wired to the control panel.

2.04 MOTOR (EXPLOSION PROO)

A. The multi-pole motor shall be directly connected to the propeller (gearbox designs are not acceptable) to produce an adequate propeller speed for the application. The mixer motor shall be squirrel cage, induction, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31. The motor shall be designed for continuous duty, capable of no less than 30 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of aluminum.

B. Thermal sensors shall be used to monitor stator temperatures. The stator shall be equipped with three (3) thermal switches embedded in the end coils of the stator winding and set for 284°F (140°C). These shall be used in conjunction with, and supplemental to, external motor overload protection, and must be wired to the control panel as required by FM regulations.

2.05 ELASTOMERS

A. All mating surfaces where watertight sealing is required shall be machined and fitted with a double set of Nitrile rubber or Viton O-rings. Fitting shall be such that sealing is accomplished by metal-to-metal contact between machined surfaces. This will result in controlled compression of the O-rings without requiring a specific torque limit. No secondary sealing compounds, rectangular gaskets, elliptical O-rings, grease or other devices shall be used.

2.06 PROPELLER

A. The propeller shall be of 316 stainless steel dynamically balanced, non-clogging backward curved design. Each blade shall be laser cut and welded to the hub to ensure that the propeller is properly balanced. The propeller shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in normal sewage applications. The propeller shall have either two or three vanes 14.5 inches in diameter.

2.07 JET RING ASSEMBLY (OPTIONAL)

A. The mixer assembly shall incorporate a jet ring a full 360 degrees around the propeller.

2.08 CABLE ENTRY

A. The cable entry housing shall be an integral part of the back plate. The cable entry shall have a double set of elastomer grommets in order to ensure a redundant system in the event of a cable entry failure. Single sealing systems will not be deemed acceptable. The cable entry shall be comprised of two cylindrical elastomer grommets, each flanked by washers and a ferrule designed with close tolerance fit against the cable outside diameter and the entry inside diameter. This will provide a leak proof seal at the cable entrance without the need for specific torque requirements.

The assembly shall bear against a shoulder in the stator casing opening and be compressed by a gland nut threaded into it. Interaction between the gland nut and the ferrule should move the grommet along the cable axially instead of with a rotary motion. The junction chamber and motor compartment shall be separated by a terminal board which shall protect the motor interior from foreign material gaining access into the mixer top. Connection shall be made between the threaded compressed type binder posts thus securely affixing the cable wires to the terminal board. The use of the terminal compressed type post and a terminal board O-ring shall render the motor compartment leak proof from any liquid which may enter the terminal compartment. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

2.09 BEARINGS

A. All bearings shall have a minimum B-10 or L-10aa rated life of 100,000 hours and shall have inner and outer races of metal construction. Bearings with races made of nonmetallic construction will not be deemed acceptable or meeting the load handling and environmental requirements of this application. The outboard propeller bearing shall be an angular contact bearing. The motor shaft end shall be supported by two bearings. A roller and an angular contact ball bearing shall take up the axial and radial loads while an angular contact ball bearing shall take up the axial loads. The bearings shall be pre-loaded by a bearing loading nut located on the motor end of the shaft in order to reduce shaft deflection and increase bearing life and seal life. Mixers without pre-loaded bearings will not be considered acceptable or equal.

2.10 OIL HOUSING

A. The oil housing shall contain two compartments consisting of an inner and an outer section with four ports to connect and facilitate oil flow. In the event that the mixed media bypasses the other seal, this design will allow the outer compartment to collect the heavier (denser) fluids by means of a simple gravity process. Mixers which require propeller removal for oil change shall not be acceptable. Separate fill and drain plugs shall be provided to facilitate oil replacement.

2.11 MECHANICAL SEALS

A. Each mixer shall be provided with two sets of lapped end face type mechanical seals running in oil reservoirs for cooling and lubrication.

B. Standard

1. The standard inner mechanical seal is corrosion resistant Tungsten Carbide/Aluminum Oxide.

2. The outer seal faces are Tungsten Carbide/Tungsten Carbide. One face of the inner seal ring pair shall have spiral grooves laser etched in it, to provide a pumping action to move leakage from the stator housing back into the oil chamber. In order to avoid seal failure due to sticking, clogging, and misalignment from elements contained in the mixed media, only the seal faces of the outer seal assembly and its retaining clips shall be exposed to the mixed media. All other components shall be contained in the oil housing.

C. Optional

1. The inner mechanical seal is corrosion resistant Tungsten Carbide/Aluminum Oxide.

2. The outer seal faces are Silicon Carbide/Silicon Carbide. One face of the inner seal ring pair shall have spiral grooves laser etched in it, to provide a pumping action to move leakage from the stator housing back into the oil chamber. In order to avoid seal failure due to sticking, clogging, and misalignment from elements contained in the mixed media, only

the seal faces of the outer seal assembly and its retaining clips shall be exposed to the mixed media. All other components shall be contained in the oil housing

2.12 SEAL SHIELD

A. The mixer shall be equipped with a seal shield that prevents fibrous material from winding up around the shaft and outer seal. The shield shall be welded to the propeller hub and extend towards the motor. The shield shall rotate with the propeller and there shall be a radial micro-gap between the shield and oil-housing

PART 3 - EXECUTION

3.01 MIXER TEST

A. The mixer manufacturer shall perform the following inspections and tests on each mixer before shipment from the factory:

1. Propeller, motor rating, and electrical connections shall first be checked for compliance to the customer's purchase order.
2. A dielectric test shall be carried out in accordance to IEC 60034-1 (two times rated voltage plus 1000 V). This test shall be done after assembly but before any performance tests. No records shall normally be provided.
3. Prior to shipment, the mixer shall be run dry to establish correct rotation and mechanical integrity.Install in conformance with ASTM D2321, the manufacturer’s recommendations, and as shown on the Drawings.

B. A written report stating the foregoing steps have been done may be supplied with each mixer at the time of shipment (upon request).

3.02 THRUST TEST (OPTIONAL)

A. If required by the specification, the mixer(s) shall be subjected to a thrust test. The nominal thrust created by the mixer, as measured in clean water, will be 800 Newtons at an input power of 3.0 kW. The test procedure and results shall be in accordance with ISO Specification ISO21630:2007.

3.03 HAZARDOUS LOCATION EQUIPMENT

A. In addition to the requirements listed above, for the installations which are considered to be in hazardous locations as defined by the National Electrical Code (NEC), only mixers certified by Factory Mutual for use in such locations shall be used.

B. Specifically, the mixers used shall be certified for use in all Class I, Divisions 1 and 2, Groups C and D, Class II, Divisions 1 and 2, Groups E, and G and Class III locations as outlined in Articles 500-502 inclusive of the NEC code.

END OF SECTION

SECTION 11321

HIGH DENSITY CROSSLINKED POLYETHYLENE TANKS

PART 1 GENERAL

1.01 GENERAL DESCRIPTION

A. Scope:

1. The CONTRACTOR shall provide an integrally molded flanged outlet (IMFO®), high density cross-linked polyethylene tank and accessories per section 2.05, complete and in place, in accordance with the Contract Documents.
2. Unit Responsibility: The CONTRACTOR shall be responsible for furnishing the integrally molded flanged outlet IMFO® tank(s) and its accessories for chemical storage as indicated.

B. Type:

1. Unless otherwise specified, tanks shall be circular cross-section, vertical, complete with piping outlets, drains, overflows, and anchoring system. Covered tanks shall be vented, and where specified, tanks shall be provided with entrance manways, level indicators, and exterior ladder.

C. Equipment List:

Item	**Equipment No.**
Sodium Hypochlorite Storage Tank No. 1	11-T-001
Sodium Hypochlorite Storage Tank No. 2	11-T-002
Sodium Hypochlorite Storage Tank No. 3	11-T-003

D. Design Requirements:

1. Physical Characteristics: Chemical storage tanks provided under this section shall have the following characteristics:

Equipment number	**11-T-001**	**11-T-002**	**11-T-003**
Type	Closed, Domed Top		
Nominal diameter, ft	10	10	10
Nominal height, ft	13’ – 7”	13’ – 7”	13’ – 7”
Nominal capacity, gallons	6,600	6,600	6,600

2. Operating Conditions: Chemical storage tanks provided under this section shall be suitable for the following operating conditions:

Equipment number	**11-T-001**	**11-T-002**	**11-T-003**

Chemical stored	Sodium Hypochlorite		
Concentration, percent	12.5		
Unit weight, lb/gal	9.96	9.96	9.96
Design specific gravity	1.196	1.196	1.196
Solution pH	11.2 – 11.4	11.2 – 11.4	11.2 – 11.4
Solution viscosity, centipoise	1.75 – 2.50 (varies with temp.)	1.75 – 2.50 (varies with temp.)	1.75 – 2.50 (varies with temp.)
Maximum fluid temperature, deg. F	125	125	125
Minimum fluid temperature, deg. F	35	35	35
Minimum ambient air temperature, deg. F	32	32	32

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 10401, Signage

1.03 QUALITY ASSURANCE

A. References:

1. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
ASTM D638	Tensile Properties of Plastics
ASTM D883	Standard Definitions of Terms Relating to Plastics
ASTM D1505	Density of Plastics by the Density Gradient Technique
ASTM D1693	Environmental Stress-Cracking of Ethylene Plastics
ASTM D1998	Standard Specification for Polyethylene Upright Storage Tanks
ASTM F412	Standard Terminology Relating to Plastic Piping Systems
UBC	Uniform Building Code
ANSI B16.5	Pipe Flanges and Flanged Fittings

Reference	Title
ARM	Low Temperature Impact Resistance (Falling Dart Test Procedure)
NSF/ANSI 61	AWWA – Drinking Water System Components

B. Quality Assurance

1. The CONTRACTOR shall provide a vertical, high density cross-linked polyethylene tank with full drain capability and molded in flange. The integrally molded flanged outlet IMFO® tanks of the same material furnished under this Section shall be supplied by Poly Processing Company or approved equal who has been regularly engaged in the design and manufacture of chemical storage tanks for over 10 years.

2. Tanks shall be manufactured from virgin materials.

C. Factory Test:

1. Following fabrication the tanks, including factory applied pipe outlet fittings, shall be hydraulically tested with water. Test methods may include adding a 2.5 psig air pad to filled tanks or filling the tanks with standpipes, raising the maximum water surface approximately 6 feet higher than the normal maximum tank level. The test duration shall be 24 hours with proof of acceptance being an affidavit signed by the factory inspector. Following successful testing, the tank shall be emptied and dried prior to shipment.

D. Manufacturer's Warranty:

1. The tank shall be warranted for five (5) years to be free of defects in material and workmanship.

E. Manufacturer's Experience:

1. The tank manufacturer shall have a record of at least ten installations during the previous 5 years for the tank sizes specified. The manufacturer must be capable of providing names of users and specific locations which can be visibly inspected.

1.04 SUBMITTALS

A. Shop Drawings: Shop drawings shall be approved by the engineer or contractor prior to the manufacturing of the integrally molded flanged outlet, IMFO® tank(s). Submit the following as a single complete initial submittal.

Sufficient data shall be included to show that the product conforms to Specification requirements. Provide the following additional information:

1. Integrally molded flanged outlet IMFO® tank and Fitting Material
   a. Resin Manufacturer Data Sheet
   b. Fitting Material
   c. Gasket style and material
   d. Bolt material
2. Dimensioned Tank Drawings
   a. Location and orientation of molded in fitting (IMFO®), openings, fittings, accessories, restraints and supports.

b. Details of inlet and molded outlet fitting (IMFO®), manways, flexible connections, and vents.

3. Calculations shall be stamped and signed by a registered, third party engineer in the State of the installation.

a. Tank restraint system. Show seismic and wind criteria.

B. Manufacturer's warranty

C. Manufacturer's unloading procedure (see Poly Processing Company Installation Manual)

D. Manufacturer's installation instructions (see Poly Processing Company Installation Manual)

E. Supporting information of Quality Management System

F. Manufacturer's Qualifications: Submit to engineer a list of 5 installations in the same service as proof of manufacturer's qualifications.

G. Electrical heat tracing and foam insulation data sheets, as required.

H. Factory Test Report

1. Wall thickness verification.
2. Fitting placement verification including molded in outlet (IMFO®)
3. Visual inspection
4. Impact test
5. Gel test
6. Hydrostatic test

PART 2 PRODUCTS

2.01 GENERAL

A. Tanks shall be rotationally-molded, integrally molded flanged outlet IMFO®, high density cross-linked polyethylene, one-piece seamless construction, cylindrical in cross-section and vertical with flat / sloping bottoms in axis. Tanks shall be adequately vented as prescribed in Poly Processing Company's Technical Bulletin, Venting-Design for ACFM (air cubic feet per minute). Where indicated, tanks shall be provided with ancillary mechanical fittings and accessories. Tanks shall be marked to identify the manufacturer, date of manufacture and serial numbers must be permanently embossed into the tank.

2.02 MANUFACTURER

A. Tanks shall be manufactured by Poly Processing Company or Engineer approved equal.

2.03 POLYETHYLENE STORAGE TANKS

A. Service: Chemical storage tanks shall be suited for the following operating conditions per this section.

B. High Density Cross-linked Polyethylene resin used in the tank manufacture shall be Poly CL™ or equal and shall contain ultraviolet stabilizer as recommended by resin manufacturer. Where black tanks are indicated, the resin shall have a carbon black compounded into it. The tank material shall be rotationally molded and be a resin that is commercially available at the time of tank manufacture.

C. For sodium hypochlorite, sulfuric acid storage, and other oxidizing chemicals, tank resin shall include an antioxidant polyethylene system (OR-1000) with four times the antioxidant properties of a standard polyethylene bonded to the interior surface during the manufacturing process.

D. Wall thickness for a given hoop stress is to be calculated in accordance with ASTM D 1998. In NO case shall the tank thickness be less than design requirements per ASTM D 1998.

1. The wall thickness of any cylindrical portion at any fluid level shall be determined by the following equation:

$T = P \times OD/2SD$ or $0.433 \times SG \times H \times OD/2SD$

Where: T = wall thickness, in

P = pressure, psi

SG = specific gravity, gm/cc

H = fluid head, ft

OD = outside diameter, ft

SD = hydrostatic design stress

a. The minimum wall thickness shall be sufficient to support its own weight in an upright position without external support but shall not be less than 0.187" thick.

2. On closed top tanks the top head shall be integrally molded with the cylindrical wall. Its minimum thickness shall be equal to the thickness of the top of the straight sidewall. In most cases, flat areas shall be provided for attachment of large fittings on the dome of the tank.

3. The bottom head shall be integrally molded with the cylindrical wall. Knuckle radius shall be:

Tank Diameter, ft	**Min Knuckle Radius, in**
Less than or equal to 6	1
Greater than 6	1-1/2

4. Tanks with 3000 gal capacity or larger shall have at least 3 lifting lugs. Lugs shall be designed for lifting the tank when empty.

a. Unless otherwise indicated by Contract drawings, for indoor pneumatic fill, manways shall be 24-in diameter or greater and equipped with an emergency pressure relief device or SAFE- Surge™ Manway with pressure relief at 6" water column to prevent over-pressurization. The SAFE-Surge manway shall be chemically compatible with the chemical being stored. Gaskets shall be closed cell, cross-linked polyethylene foam, Viton, or EPDM materials.

b. Unless otherwise indicated by Contract drawings, for outdoor pneumatic fill, manways shall be 24-in diameter or greater and equipped with Poly Processing Company's F.S.2650® combined manway and vent to prevent over pressurization of tank. Manway must be capable of relieving a volume flow rate of up to 2650 ACFM. Gaskets shall be closed cell, cross- linked polyethylene foam, Viton, or EPDM materials.

c. Unless otherwise indicated, tanks less than 2000 gallons in non-pneumatic applications shall have a manway cover 17-in or smaller of Polyethylene material with a coarse thread. Gaskets shall be closed cell, cross-linked polyethylene foam, viton or EPDM materials.

NOTE: Tanks must be vented to allow for performance at atmospheric pressure, in accordance with the following matrix:

Venting Requirements For Polyethylene Tanks

Mechanical Pump Fill	**Pneumatic Fill**								
IF ≤ 1000 gallons	**IF** - Vent length ≤ 3 feet			**IF** - Vent length > 3' and ≤ 30'			**IF** - Scrubber Application		
Vent size should equal size of largest fill or discharge fitting	**AND - Vent** screen mesh size ≥ 1/4" or no screen used			**AND -** 3 or less 90° elbows with no other restrictions or reduction in pipe size			**Vent pipe size throughout scrubber system CANNOT be reduced!** Centerline of dispersion pipe not to be submersed > 6 inches		
IF > 1000 gallons	**Emergency Pressure Relief Cover Required**			**Emergency Pressure Relief Cover Required**			Perforated dispersion pipe must be same diameter or larger, as vent. Sum of perforations ≥ cross sectional area of pipe		
Vent size should exceed the largest fill or discharge fitting by 1 inch	Tanker Discharge	Inlet/Fitting Size	Minimum Vent Size	Tanker Discharge	Inlet/Fitting Size	Minimum Vent Size	Tanker Discharge	Inlet/Fitting Size	Minimum Vent Size
	2"	2"	4"	2"	2"	6"	2"	2"	6"
	3"	2"	6"	3"	2"	6"	3"	2"	8"
	3"	3"	6"	3"	3"	8"	3"	3"	10"

(2) 2 inch vents **DO NOT EQUAL** 4 inch venting capacity rev. Nov 2006

For detailed venting guidelines, please visit our Technical Resources at www.polyprocessing.com

E. Tank colors shall be opaque white, or as specified by the ENGINEER with written agreement by the tank manufacturer.

2.04 TANK ACCESORIES

A. Ladder:

1. Fiberglass access ladders shall be provided with the polyethylene chemical storage tanks at locations as shown. Safety cages shall be added to ladders as required, per OSHA.

2. Ladders must be secured to the tank and secured to the concrete to allow for tank expansion/contraction due to temperature and loading changes. Use proper chemical resistant materials when anchoring to tank dome or sidewall. See Poly Processing Company's Tank Installation Manual.

3. All ladders shall be designed to meet applicable OSHA standards.

   a. Reference: OSHA 2206; 1910.27; fixed ladders.

B. Restraint System:

1. Metal components to be stainless steel, edge softeners, and tension ring with stainless steel cables and clamps.

2. Tank restraint system shall be supplied and the design of same certified by a Structural Engineer registered in the State of tank installation. Design shall conform to the most recent edition of the IBC code for seismic and wind load. Anchor bolts as required by the calculations shall be supplied by the tank manufacturer.

2.05 TANKS

A. Tank Schedule:

Equipment number		11-T-001; 11-T-002; & 11-T-003			
SERVICE		SIZE	FITTING	DEG	ELEVATION
A	LID / MANWAY	24"	ACCESS LID WITH 8--BOLT ASSEMBLY	180°	DOME
B	FILL PORT	3"	FLANGE	13°	DOME
C	SPARE	2"	FLANGE	300°	DOME
D	ULTRASONIC LEVEL	6"	FLANGE	262°	DOME
E	DRAIN	4"	FLANGED CONENCTION WITH 4" BUTTERFLY VALVE	0°	2-1/4" FROM TANK BOTTOM
F	VENT	6"	FLANGE	80°	DOME
G	LEVEL MEASUREMENT	2"	LEVEL GAUGE	105°	DOME
H	OVERFLOW PORT	4"	BULKHEAD ASSEMBLY WITH OVERFLOW PIPE	50°	11' - 1/2" FROM BOTTOM OF TANK
J	OUTLET	2”	FLANGE	0°	4” FROM TANK BOTTOM
K	DEGAS CONNECTION	2”	FLANGE	345°	DOME
L	LADDER			180°	SIDEWALL
M	RESTRAINT		WITH (16) ANCHOR RODS 7/8" (MIN) X 10" (MIN) 316SS ANCHOR DESIGN TO BE PROVIDED BY TANK SUPPLIER	18° 63° 108° 153° 198° 243° 288° 333°	SIDEWALL

B. Fittings:

1. Tank fittings shall be according to the fitting schedule in 2.05A above. Threaded fittings shall use American Standard Pipe Threads. If tanks are insulated, fittings shall be installed at the factory prior to application of the insulation.

2. Integrally Molded Flanged Outlet Fittings (IMFO). Fully flush bottom outlet must be an integral part of the tank, molded from the same material as the tank and provide complete drainage of liquid through the sidewall of the tank. Outlets with molded metal or plastic inserts through the tank wall are not acceptable. Contractor shall coordinate dimensions and sizes of tank pad blockout with tank manufacturer.

3. Bolted flange fittings shall be constructed of one 150 lb. flange with ANSI bolt pattern, one flange gasket and stud bolts with gaskets. Stud bolts to have chemical resistant polyethylene injection molded heads and gaskets to provide a sealing surface between the bolt head and the interior tank wall. Stud bolt heads are to be color coded for visual ease of identifying the bolt material by onsite operators. Green- 316 Stainless Steel, Black- Titanium, Red- Alloy C-276, Blue- Monel. All materials shall be compatible with chemical service and as indicated in the fitting schedule above. For NSF/ANSI 61 certification, EPDM or Viton GF gaskets shall be supplied.

4. For sodium hypochlorite and sulfuric acid storage, Bolted One-Piece Sure Seal (B.O.S.S.), double flange fittings constructed of virgin polyethylene shall be supplied. Bolts will be welded to a common backing ring and encapsulated with polyethylene preventing fluid contact with the metal material. Flange will have one full face gasket to provide a sealing surface against inside tank wall. All materials shall be compatible with chemical service and as indicated in the fitting schedule above. For NSF/ANSI 61 certification, EPDM or Viton GF gaskets shall be supplied.

5. Down Pipes and Fill Pipes: Down pipes and fill pipes shall be supported at 6-ft max intervals. Down pipes and fill pipes shall be PVC or material compatible with the chemical stored.

6. U-Vents: Each tank must be vented for the material and flow and withdrawal rates expected. Vents should comply with OSHA 1910.106(F) (iii)(2)(IV)(9). U-vents shall be sized by the tank manufacturer and be furnished complete with insect screen if required (Insect screen lessens the vent capacity by 1/3) in accordance with the venting schedule listed above.

7. All fittings on the 1/3 lower sidewall of tanks with capacities > 1000 gallons shall have 100% virgin PTFE Flexi-joint® expansion joint. Expansion joint to have a minimum of 3 convolutions, stainless steel limit cables and FRP composite flanges. Galvanized parts will not be accepted.

8. Expansion joint to meet the following minimum performance requirements:

   Axial Compression ≥ 0.67”

   Axial Extension ≥ 0.67”

   Lateral Deflection ≥ 0.51”

   Angular Deflection ≥ 14º

   Torsional Rotation ≥ 4º

2.06 LEVEL INDICATORS

A. Float Indication: The level indicator shall be assembled to the tank and shall consist of PVC float, indicator, polypropylene rope, perforated interior pipe, PVC roller guides, clear UV resistant PVC sight tube EnviroKing® by C.F. Harvel, and necessary pipe supports. The level indicator shall act inversely to the tank contents and shall not allow entrance of tank contents into the sight tube at any time. Indicator shall be neon orange color for visual ease for onsite operators.

B. Ultrasonic Level Indicator: The ultrasonic level indicator shall be a Flowline ultrasonic level transmitter, level controller with one 4-20 mA or 0-10 VDC continuous level input and NEMA 4X box to be supplied by tank manufacturer.

2.07 SAFETY SIGNS

A. Each tank inlet and tank outlet shall be clearly marked with hazardous material warning signs, 10 inches by 14 inches in size. Each sign shall have the words "DANGER" and the name of the chemical stored, printed in large block letters and mounted directly adjacent to the tank outlet and tank inlet. Each entry manway shall be provided with a sign ("DANGER--CONFINED SPACE--HAZARDOUS ATMOSPHERE"). Signs shall comply with Section 10401, Signage, modified as specified herein.

2.08 FACTORY TESTING

A. Material Testing

1. Perform gel and low temperature impact tests in accordance with ASTM D 1998 on condition samples cut from each polyethylene chemical storage tank.

2. Degree of Cross-linking. Use Method C of ASTM D 1998- Section11.4 to determine the ortho-xylene insoluble fraction of cross-linked polyethylene gel test. Samples shall test at no less than 60 percent.

B. Tank Testing

1. Dimensions: Take exterior dimensions with the tank empty, in the vertical position. Outside diameter tolerance, including out-of-roundness, shall be per ASTM D 1998. Fitting placement tolerance shall be +/- 1/2-in vertical and +/- 1 degree radial.

2. Visual: Inspect for foreign inclusions, air bubbles, pimples, crazing, cracking

3. Hydrostatic test: Following fabrication, the bottom tanks, including inlet and outlet fittings, shall be hydraulically tested with water by filling to the top sidewall for a minimum of 1 hour and inspected for leaks. Following successful testing, the tank shall be emptied and cleaned prior to shipment.

PART 3 EXECUTION

3.01 DELIVERY, STORAGE, AND HANDLING

A. The tank shall be shipped upright or lying down on their sides with blocks and slings to keep them from moving. AVOID sharp objects on trailers.

B. All fittings shall be installed and, if necessary, removed for shipping and shipped separately unless otherwise noted by the contractor.

C. Upon arrival at the destination, inspect the tank(s) and accessories for damage in transit. If damage has occurred, Poly Processing Company shall be notified immediately.

3.02 INSTALLATION

A. Install the tanks in strict accordance with Poly Processing Company’s Tank Installation Manual and shop drawings.

B. Installation will be inspected by manufacturer to verify system flexible connections, venting and fittings are properly installed. In addition to on-sight inspection tank system(s) to be reviewed using tank manual check list as supplied by manufacture as listed below.

C. Manufacturer to provide 1 hour training session to prepare operators to service and maintain the tank system. Included in training session will be (#) training manuals.

D. Manufacturer's trained technician to do an onsite inspection of installation. Inspection will verify chemical application, plumbing connections, venting, and applicable ancillary equipment such as ladders, restraints, etc. A verification of proper installation certificate will be supplied when equipment passes installation checklist.

E. Tank manuals will consist of installation check lists, tank drawing(s) as built, fitting drawings referencing nozzle schedule on tank drawing, materials of construction, and recommended maintenance program.

3.03 FIELD TESTING

A. Poly Processing Company recommends that all tanks be hydro-tested for 24 hours prior to commissioning.

END OF SECTION

SECTION 11324

SUBMERSIBLE PUMPS

PART 1 - GENERAL

1.01 SCOPE

A. The Contractor shall furnish all labor, materials, equipment, and incidentals required to supply, modify, install, test, and place in satisfactory operation new electric submersible sampling pumps as shown on the Drawings and as specified herein.

B. All items covered in this Specification shall be furnished by a single manufacturer.

C. The pump Manufacturer shall ensure the correct fit and compatibility of all components. The pump Manufacturer shall also ensure that the items specified herein function as a complete and workable system.

1.02 EQUIPMENT LIST

A. The major items of equipment covered under this section include but is not necessarily limited to the equipment listed below.

Eqp. No.	Description
11-SMP-001	Chlorine Analyzer Sample Pump
11-SMP-002	Chlorine Analyzer Sample Pump

B. Sample pumps shall be Goulds LSP0711AF.

C. All components of the pumping units shall be supplied and coordinated by the pump manufacturer.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Division 16, Electrical

1.04 SUBMITTALS

Complete assembly, support, and installation drawings, together with detailed specifications and data covering pumps, controls, material used, parts, devices, and other accessories forming a part of the equipment furnished, shall be submitted to the Engineer for approval in accordance with the procedure set forth in the Section 01300, Submittal Procedure. Data and specifications for the equipment shall include, but shall not be limited to, the following as applicable:

A. Setting Plans: Setting plans shall include:

1. Guide rail bolt layout.
2. Guide rail bolt dimensions.
3. Outline dimensions and weights of pumps, motors, bases and control enclosures.

4. Pump discharge connection detail.

5. Detailed drawings for installation of new guide rails.

B. Pumps: Data and drawings shall include:

1. Types and model numbers. Pumps shall be Goulds LSP0711AF pumps.

2. Assembly drawings, nomenclature and material list.

3. Type, manufacturer and model numbers of bearings.

4. Maximum rotative speed of pumps.

5. Pump dimensions and weights, materials, coupling data, bearing life calculations.

6. Pump performance curves showing head vs. capacity at varying speeds, efficiency, brake horsepower, and $NPSH_R$. The manufacturer shall indicate by arrows to points on the H/Q curves the limits recommended for stable operation, between which the pumps are to be operated to prevent surging, cavitation, and vibration. The stable operating range shall be as large as possible and shall be based on actual hydraulic and mechanical characteristics of the units.

C. Pump Tests: See paragraph 1.06.I of this specification for pump test requirements.

1.05 OPERATION AND MAINTENANCE MANUALS

A. Submit operations and maintenance manuals for the equipment in compliance with the Contract documents, prior to shipment. Manuals shall include:

1. Name, address, and telephone number of the nearest competent service representative who can furnish parts and technical service.

2. Descriptive literature, including illustrations, covering the operational features of the equipment, specific for the particular installation, with all inapplicable information omitted or marked out.

3. Operating, maintenance and troubleshooting information.

4. Complete maintenance parts list.

5. Complete connection, interconnecting and assembly diagrams.

6. Approved shop drawings including complete electrical information.

1.06 QUALITY ASSURANCE

A. Unit Responsibility: All equipment shall be of new and of current manufacture. The pump, mechanical seals and motor units provided under this specification shall be identical and from the same manufacturer in order to achieve standardization of operation, maintenance, spare parts, manufacturer's service and warranty. The pump manufacturer and the Contractor shall assume full responsibility for the completeness of the pumping system. The pump manufacturer shall be the source of information on all respective pumping equipment furnished per this section of the Specifications.

B. Manufacturer's Qualifications: The pump manufacturer(s) and motor manufacturer(s) shall have experience in manufacturing equipment of the same size or larger to the pumps and motors specified. For a manufacturer to be determined acceptable for providing equipment on this

project, it must show evidence of five separate, substantially similar installations which have been in satisfactory operation for a minimum of five years.

C. Quality Assurance Program: Pumps are to be engineered and manufactured under a written quality assurance program. The quality assurance program is to be in effect for at least ten years, to include a written record of periodic internal and external audits to confirm compliance with such program.

D. Certification: Pumps are to be engineered and manufactured under the certification of ISO-9001:2000.

E. Source Quality Control:

1. Pump Shop Tests:

a. Each pump shall be tested in accordance with the latest test code of the Hydraulic Institute (H.I.) **at the factory** to determine head vs. capacity and kilowatt draw required. Witness tests shall be available at the factory upon request.

b. Running Performance Test: Each pump shall be operated from zero to maximum capacity. Results of the tests shall be shown in a plot of test curves showing total head, flow, pump input power, net positive suction head required, pump efficiency, and pump efficiency at design running speed(s). Recording and computation of test results shall be in accordance with HIS. Readings shall be taken at a minimum of 5 evenly spaced capacity points including shutoff, design point, minimum and maximum head for which pump is designed to operate.

c. Each test shall be witnessed by a registered Professional Engineer, who may be an employee of the manufacturer. The engineer shall sign all copies of curves and test reports and shall certify that hydrostatic tests were performed. Test shall be conducted in conformance with the methods described in HIS.

d. Pumping units shall be within the following tolerances: HIS level A

(1) At design head, +10 percent of design capacity or at design capacity, +5 percent of design head.

(2) No minus tolerances shall be allowed with respect to capacity, total head, or the manufacturer's guaranteed bowl efficiency at the design point.

e. Pumps shall not be shipped until the Engineer has approved the test reports.

2. Field Tests: See Part 3 of this Section for field test requirements.

1.07 GUARANTEE AND WARRANTY

A. The Contractor shall obtain from the manufacturer a warranty for all material, equipment, and appurtenances for one year from the date of substantial completion.

B. During the warranty period, the Contractor shall provide the services of a trained manufacturer's representative to make all adjustments, repairs and replace all defective material and equipment at no cost to the Owner.

C. The Contractor shall include all costs incurred by the manufacturer, including travel and expenses, under the terms of the warranty.

PART 2 - EQUIPMENT

2.01 GENERAL

A. The submersible pumps shall be self contained, integral pump/motor pumping units of the non-clog, solids-handling type.

2.02 PERFORMANCE/DESIGN CRITERIA

A. Each pump shall be capable of operation in manual or automatic control modes as specified in Division 11 “Instrumentation and Control Requirements”.

B. "Overall Efficiency" shall mean the combined pumping unit efficiency of the motor efficiency and hydraulic efficiency.

C. Pump characteristic curve shall continuously rise from minimum head to shutoff with no intermediate dips.

D. Pumps shall be designed to operate continuously at full nameplate load partially or completely submerged

E. Each pump shall operate without surging, cavitation, or vibration under all conditions specified herein, and shall be rated for continuous stable operation at all points on the pump operating curve from shut-off to run-out head. To insure vibration free operation, all rotative components of each pumping unit shall be statically and dynamically balanced.

2.03 PUMP CONSTRUCTION

A. Casing/Volute: The pump casing shall be manufactured of close-grained cast iron, ASTM A48, Class 35 or better. The casing shall be cast as one piece with the volute and shall be able to pass any size solid that can pass through the impeller.

B. Impeller: Each pump impeller shall be manufactured of close-grained cast iron, ASTM A48, Class 35 or better. The impellers shall be of one-piece construction, single suction, enclosed, radial flow design, or semi-open, multi-vane, back swept, screw-shaped design and shall be statically and dynamically balanced.

C. Wear Rings: A replaceable 400 series stainless steel wear ring shall be securely fastened to the impeller inlet to reduce the effects of abrasive wear and provide the ability to renew the running clearance. A replaceable 400 series stainless steel wear ring shall be securely fastened to the volute suction. The surface hardness of the impeller and volute wear rings must be at least 50 Brinell points different from one another.

D. External Hardware: All external hardware shall be 316 stainless steel.

2.04 SLIDING GUIDE RAIL BRACKET AND RAIL SYSTEM

A. General: The Contractor shall furnish and install for each influent pump, a complete slide-away coupling and guide rail system that is designed such that each pump can be removed from the pumping station wet well without entering the well or disconnecting the piping. Each system shall consist of a foot-mounted discharge elbow and adapter, guide rails, slide brackets, rail supports, and stainless steel lifting handle and stainless steel lifting chain/cable. All metal to metal interfaces where movement might occur shall be non-sparking.

B. Base Discharge Elbow and Slide Bracket: The foot-mounted base discharge elbow shall meet the slide bracket by method of a three point, wedged engagement that is designed to match the volute flange to the stationary elbow to eliminate head losses. The discharge elbow shall be designed to carry the full weight of the pump, motor, and discharge piping as well as anticipated thrusts. No portion of the pump shall bear directly on the sump floor. The slide bracket and base discharge elbow shall be cast iron. The base discharge elbow shall have an integrally cast mounting base plate.

C. Guide Rail System: The pumps shall be automatically and firmly connected to the discharge connection when lowered into place and shall be guided by two guiderails extending from the top of the wet well to the discharge connection. The guide rails shall be adequately sized and shall have a support placed at the manufacturer's recommended spacing to prevent bending. The brackets shall be designed to fit exactly into the pipes for which they were designed; adjustable or flexible brackets will not be acceptable. Mounting brackets shall be constructed of Type 316 Stainless Steel.

D. Lifting Chain/Cable: Each pump shall be fitted with 316 stainless steel lifting chain/cable. The working load of the lifting system shall be at least 50% greater than the pump unit weight.

E. Hardware: All anchor bolts, nuts, and washers shall be 316 stainless steel and shall be furnished by the equipment manufacturer.

2.05 MOTORS AND DRIVE UNITS

A. Motors shall be of sufficient size so that there will be no overload on the motor above rated nameplate horsepower under any condition of operation exclusive of service factor. Motors shall be suitable electrically and mechanically for driving the equipment.

B. The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chlorinated polyethylene rubber. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 50 feet or greater.

C. Pumps shall be provided with the necessary power and control cables

2.06 NAMEPLATES

A. Nameplates shall be stainless steel with embossed lettering and shall be fastened to each pump frame with corrosion resistant pins. Nameplates shall show manufacturer's name, serial number, type and model, size, and capacity and head at maximum speed.

PART 3 - EXECUTION

3.01 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver all materials to the site to insure uninterrupted progress of the Work. Deliver all pump guide rail mounting equipment and all other mounting equipment which is to be embedded in concrete in ample time so as to not delay progress of the Work.

B. Handle all pumps, motors, and appurtenances very carefully. Damaged equipment will not be acceptable. Protect all bolt threads, etc. from damage and corrosion. Protect all factory applied coatings from damage during shipment, unloading, storage, and installation.

C. Pumps shall be covered and stored in a manner which will prevent entry of deleterious matter. Power cables shall be covered and stored in a manner which will protect them from dirt and abrasion or moisture.

3.02 FIELD TESTING

A. Testing performed upon each pump shall include the following inspections:

1. Impeller, motor rating and electrical connections shall be checked for compliance with this specification.
2. Prior to submergence, each pump shall be run dry to establish correct rotation.
3. Each pump shall be run submerged in water.
4. Motor and cable insulation shall be tested for moisture content or insulation defects.

B. Upon request, a written quality assurance record confirming the above testing/inspections shall be supplied with each pump at the time of shipment.

C. The pump(s) shall be rejected if the above requirements are not satisfied.

3.03 MANUFACTURER SERVICES

A. The equipment manufacturer shall furnish the services of a qualified factory trained field service engineer for 4-hour working day(s) at the site to inspect the installation and instruct the owner's personnel on the operation and maintenance of the pumping units. After the pumps have been completely installed and wired, the contractor shall have the manufacturer do the following:

1. Megger stator and power cables.
2. Check seal lubrication.
3. Check for proper rotation.
4. Check power supply voltage.
5. Measure motor operating load and no load current.
6. Check level control operation and sequence.

B. During this initial inspection, the manufacturer's service representative shall review recommended operation and maintenance procedures with the owner's personnel.

C. Factory-Approved service facilities with qualified factory-trained mechanics shall be available for prompt emergency and routine service.

END OF SECTION

SECTION 11330

PERISTALTIC METERING PUMP

PART 1 - GENERAL

1.01 SCOPE

A. Contractor shall furnish all labor, materials, equipment and incidentals required to supply, modify, install, test and place in satisfactory operation positive displacement, peristaltic type tubing pump with a brushless variable speed motor, non-spring-loaded roller assembly located in the pumphead, integral tube failure detection system, tube life roller revolution counter with user alarm set-point and flexible tubing with attached connection fittings.

B. All items covered in this Specification shall be furnished by a single manufacturer.

C. The pump Manufacturer shall ensure the correct fit and compatibility of all components. The pump Manufacturer shall also ensure that the items specified herein function as a complete and workable system.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 11430, Chemical Skid System

B. Section 11415, In-Line Flow Measuring Systems

C. Division 16, Electrical

1.03 DRAWINGS AND DATA

The information submitted by the Contractor in accordance with Section 01300 shall include, but not be limited to, the following items:

A. Shop Drawings showing in detail, the installation of all equipment and appurtenances covered by this specification. Shop Drawings shall include, but not be limited to:

1. Anchoring details.
2. Details of support members.
3. Detailed assembly, installation, and start-up procedures.
4. Dimensions, elevations and materials for all equipment items and appurtenances listed in this specification.
5. Seismic calculations for determining the anchoring requirements for pumps.
6. Pump Data (EA): Furnish literature, illustrations, specifications and engineering data including: dimensions, hose and roller life calculations, pressure limitations, materials, paint systems, size, performance data, operating speeds, flow rate, and head.

7. Drive System:

   a. For each motor furnish a certified motor data sheet for the actual motor or for a previously manufactured electrically duplicate motor which was tested. Provide the following minimum data:

      (1) Speed-torque relationship.

      (2) Efficiency at 1/2, 3/4 and full load.

      (3) Power factor at 1/2, 3/4 and full load.

      (4) Slip at full load.

      (5) Running light, full load and locked rotor current.

      (6) Temperature rises and results of dielectric tests.

      (7) Type and frame size.

      (8) Bearing type and lubrication medium.

      (9) Insulation and enclosure type.

      (10) Safe running time-current curves.

8. Thrust Bearing Data: Type, specification, lubricant specification, maximum applied load, capacity, bearing load and life (minimum) at rated speed and shut-off head.

9. Arrangement: Provide complete dimensioned arrangement drawings showing the assembled pump, motor, couplings, anchor bolts, support base, and major components.

10. Wiring: Provide drawings showing sizes and location for all wiring connecting to external devices. Number all terminal blocks.

11. Weights: Provide list of weights of major pumping unit components, including discharge head, motor, column, bowl assemblies, impeller, and sole plates.

12. Manufacturer's Certification and Reports:

   a. Provide all manufacturer's certification and reports required in Part 1 of this Section.

   b. Report on field tests including vibration tests.

   c. Acceptance of any report or certification by the Engineer shall not relieve the Contractor from his responsibility to meet the requirements of the Contract Documents.

   d. Provide certification from the pump Manufacturer that the variable frequency drive motor controller being supplied is proper for the control of the motor and pump being furnished.

13. Shop Test Results:

   a. Certified pump and motor test data.

   b. Copies of torsional and critical speed analysis.

14. Field Test Results: Submit all results of field tests.

15. Calculations signed and sealed by a registered professional engineer in the State of California verifying that the diameter and embedment of the existing anchor bolts are suitable for use in the installation of the new pumps.

16. Certification from pump Manufacturer that pump can diameter meets Hydraulic Institute Standards and that can velocities are within appropriate limits.

B. Operation and Maintenance Data: Submit Operations and Maintenance Manuals in accordance with Section 01360.

C. Manufacturer's And Supplier's Field And Test Data: All test and field data collected by the manufacturers/suppliers of equipment during installation supervision and start-up services, where required in the Specifications, shall be submitted by the Contractor to the District within fourteen (14) days after the start-up services are complete.

The test and field data shall be submitted whether specified or not in the detailed equipment specifications and shall include but not be limited to tolerance and alignment measurements where applicable to certify equipment has been satisfactorily installed, and all other information collected by the manufacturers/suppliers to satisfy themselves that equipment has been properly installed. In cases where the manufacturers/suppliers feel equipment is not properly installed, manufacturers and suppliers shall include with this submittal a punch list detailing the problems noted. The information required under this section shall be furnished for all equipment and devices requiring installation and start-up services as specified in the Specifications and as required for a complete and operable system.

D. Factory Test and Certification: All equipment, devices and systems requiring factory test and certification as required by these Specifications, may be witnessed by the District at the District's expense by reporting intent to do so to the Contractor.

The Contractor shall notify the District in writing, at least fourteen (14) calendar days prior to testing by the manufacturer. The written notifications shall specify the exact date and location the tests shall be conducted, and all testing shall be performed during normal working hours.

1.04 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Pump manufacturer(s) and motor manufacturer(s) shall have experience in manufacturing equipment of the same size or larger to the pumps and motors specified. For a manufacturer to be determined acceptable for providing equipment on this project, it must show evidence of five separate, substantially similar installations which have been in satisfactory operation for a minimum of five years.

B. All equipment shall be new and of current manufacture. All pumps shall be identical and obtained from a single manufacturer. The pump Manufacturer and the Contractor shall assume full responsibility for the completeness of the pumping system. The motors shall be obtained from a single manufacturer. The pump Manufacturer shall be the source of information on all pumping equipment furnished.

C. Source Quality Control:

1. Pump Shop Tests:

a. Pump columns, discharge heads, and bowl assemblies shall be hydrostatically tested to twice the design total head or one-and-a-half times the shut-off head, whichever is greater.

b. Running Test: Each pump shall be operated from zero to maximum capacity. Results of the tests shall be shown in a plot of test curves showing bowl head, total head, flow, pump input power, net positive suction head required, pump efficiency, and pump efficiency at design running speed(s). Recording and computation of test results shall be in accordance with AWWA E101. Readings shall be taken at a minimum of 5 evenly spaced capacity points including shutoff,

design point, minimum and maximum head for which pump is designed to operate.

c. Each test shall be witnessed by a registered Professional Engineer, who may be an employee of the manufacturer. The engineer shall sign and seal all copies of curves and test reports and shall certify that hydrostatic tests were performed. Test shall be conducted in conformance with the methods described in AWWA E101.

d. Pumping units shall be within the following tolerances:

(1) At design head, +10 percent of design capacity or at design capacity, +5 percent of design head.

(2) No minus tolerances shall be allowed with respect to capacity, total head, or the manufacturer's guaranteed bowl efficiency at the design point.

e. Pumps shall not be shipped until the Engineer has approved the test reports.

2. Field Tests: See Part 3 of this Section for field test requirements.

D. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

1. Standards of the Hydraulic Institute.

2. Standards of the American Water Works Association.

3. National Electric Code.

4. Standards of National Electrical Manufacturer's Association.

5. Institute of Electrical and Electronic Engineers.

6. American Gear Manufacturers Association.

7. American National Standards Institute.

8. Anti-Friction Bearing Manufacturers Association, Inc.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the site to insure uninterrupted progress of the work. Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete in ample time not to delay that work.

B. Packaging shall be as required to prevent damage during shipment and unloading.

C. Handle all equipment and materials very carefully. Damaged equipment and materials will not be acceptable. Protect all bolt threads, etc. from damage and corrosion. Protect all factory applied coatings from damage during shipment, unloading, storage and installation.

D. All material and equipment shall be covered or stored in a manner which will prevent entry of deleterious matter. Power cables shall be covered or stored in a manner which will protect them from dirt and abrasion.

1.06 GUARANTEE AND WARRANTY

A. The Contractor shall obtain from the pump Manufacturer a five (5) year warranty for all pumps, motors, controls, and appurtenances for one year from the date of Substantial Completion.

B. During the warranty period, the Contractor shall provide the services of a trained manufacturer's representative to make all adjustments, repairs and replace all defective material and equipment at no cost to the Owner.

C. The Contractor shall include all costs incurred by the manufacturer, including travel and expenses, under the terms of the warranty.

PART 2 - PRODUCTS

2.01 GENERAL

A. All items specified in this section shall be the unit responsibility of the pump Manufacturer. Manufacturer shall be responsible for furnishing a compatible, complete and operable system as specified.

B. The equipment covered under this section include:

Item No.	Description	Associated Chemical Skid
11-CMP-005	Chemical Metering Pump No. 1	11-CMP-005
11-CMP-006	Chemical Metering Pump No. 2	11-CMP-006

All components of the pumping unit shall be supplied and coordinated by the pump manufacturer.

2.02 METERING PUMP

A. Metering Pump shall be a positive displacement, peristaltic type tubing pump with a brushless variable speed motor, non-spring-loaded roller assembly located in the pumphead, integral tube failure detection system, tube life roller revolution counter with user alarm set-point and flexible tubing with attached connection fittings. FLEXFLO M4 model shall be capable of output volumes from 0.0028 to 158.5 gallons per hour (0.0108 to 600 liter per hour).

1. There shall be no valves, diaphragms, springs, or dynamic seals in the fluid path. Process fluid shall contact the pump tubing assembly and connection fittings only.
2. Pump shall be capable of 24-hour continuous duty, self-priming and operating in either direction of flow at the rated maximum pressure of up to 125 PSI (8.6 bar).
3. Pump shall be capable of running dry without damage.
4. Pump shall be capable of operating in either direction without output variation.
5. Suction lift shall be 30 feet (9.14 m) of water.

2.03 PUMPHEAD

A. Pumphead shall be a single, unbroken track with a clear removable cover.

1. Tube failure detection sensors shall be constructed of two Hastelloy C pins that are located at the bottom of the pump head. The Hastelloy C pins shall act as electrical contacts. When both Hastelloy C pins are immersed in a conductive fluid, a circuit shall be completed between the pins and indicate a tube failure has occurred. Tube failure detection system shall not trigger with water contact from rain or condensation. Float type switches shall not be used. Process fluid waste ports or leak drains shall not be provided.

2. Squeeze rollers with encapsulated ball bearings shall be directly coupled to a one-piece thermoplastic rotor. Four nylon rollers shall be provided; two squeeze rollers for tubing compression shall be located 180 degrees apart and two guide rollers that do not compress the tubing shall be located 180 degrees apart. The roller diameters and occlusion gap shall be factory set to provide the optimum tubing compression; field adjustment shall not be required. Spring-loaded or hinged rollers shall not be used.

3. Squeeze and guide roller arms shall be removeable for ease of replacement.

4. Rotor assembly shall be installed on a D-shaped, chrome plated motor shaft and removable without tools.

5. For tubing installation and removal, rotor assembly shall be rotated by the motor drive at 6 RPM maximum when the pumphead cover is removed. Hand cranking of the rotor assembly shall not be required.

6. Pump head and tubing compression surface shall be corrosion resistant Valox thermoplastic.

7. The pump head cover shall be clear, polycarbonate thermoplastic with an integral ball bearing fitted to support the overhung load on the motor shaft. Cover shall include an imbedded magnetic safety interlock which will limit the motor rotation speed to 6 RPM when removed.

8. Cover shall be positively secured to the pump head using a minimum of four thumb screws. Tools shall not be required to remove the pump head cover.

2.04 PUMP TUBE ASSEMBLY

A. To ensure pump performance and accuracy, only tubing provided by the manufacturer is acceptable.

B. Pump tube shall be assembled to connection fittings of PVDF material.

C. Connection fittings shall be permanently clamped to the tubing with stainless steel clamps or over molded directly to the tubing. To prevent tubing misalignment and ensure accuracy, fittings shall insert into keyed slots located in the pump head and secured in place by the pump head cover.

D. Connection fittings shall be 1/2” M/NPT. (Engineer to specify)

E. Tube sizes and connections shall be measured in inches.

F. The following tube sizes shall be available: ½”

2.05 DRIVE SYSTEM

A. Drive system shall be factory installed and totally enclosed in a NEMA 4X, (IP66) wash-down enclosure. Capable of operating on any input power from 110VAC to 240VAC, 50/60 Hz single phase supply without user configuration or selection switches.

1. Motor

   a. Reversible, brushless DC gear motor rated for continuous duty.

   b. Motor shall include overload protection.

   c. The maximum gear motor RPM shall be 125 RPM.

2. Enclosure

   a. Bottom housing shall be pressure cast aluminum with acidic liquid iron phosphate three-stage clean and coat pretreatment and exterior grade corrosion resistant polyester polyurethane powder coat.

   b. Top housing shall be structural foam molded Noryl engineered thermoplastic.

   c. Rated NEMA 4X (IP66).

   d. Provided with 316SS floor/shelf level mounting brackets and hardware. Optional: provide extended height brackets for mounting pump 4.5 inches above grade level. (Engineer to specify)

   e. M12 receptacles shall be located at the rear of the pump for input and output signals.

   f. RJ45 receptacle shall be located at the rear of the pump for use with EtherNet/IP and Modbus TCP/IP.

   g. One M12 receptacle shall be located at the rear of the pump for use with Profibus.

3. Control Circuitry. All control circuitries shall be integral to the pump.

   a. All control circuitries shall be integral to the pump and capable of adjusting the pump motor speed from 0.01% to 100.0% in 0.01% increments less than 10% motor speed, in 0.01% and in 0.1% increments greater than 10% motor speed (10,000:1 turndown ratio).

   b. The pump output shall be capable of being manually controlled via front panel touchscreen. The pump motor speed shall be adjustable from 0.01% to 100.0% in 0.01% increments less than 10% motor speed and in 0.1% increments greater than 10% motor speed.

   c. The pump output shall be capable of being remotely controlled via 4-20mA analog input. The input resolution shall be 0.01 of input value and capable of adjusting the pump motor speed from 0% to 100.0% motor speed in 0.1% increments. Four values shall be user configurable to define the low and high points on the output slope: a low input value, the required pump percentage of motor speed at the low input value, a high input value, the required pump percentage of motor speed at the high input value.

   d. The pump output shall be capable of being remotely controlled via TTL/CMOS digital high-speed pulse type input and an AC sine wave type pulse input in the range of 0 to 1,000 Hz. The frequency resolution shall be 1 Hz and capable of adjusting the pump motor speed from 0% to 100.0% motor speed in 0.1% increments. Four values shall be user configurable to define the low and high points on the output slope: a low input value, the required pump percentage of motor speed at the low input value, a high input value, the required pump percentage of motor speed at the high input value.

   e. The pump output shall be capable of being remotely controlled via pulse triggered batching. The pump shall accept a TTL/CMOS digital pulse type input and a contact closure type pulse input in the range of 1 to 5,629,499,534,21,312 pulses per batch. The batch time shall be adjustable from 1 to 5,629,499,534,21,312 seconds. The pump motor speed during the batch shall be adjustable from 0% to 100.0% motor speed in 0.1% increments.

   f. Pump shall be capable of remote priming via non-powered contact closure loop.

g. The pump output shall be capable of being controlled via 4-20mA signal.

h. Provide a front panel touchscreen control for stop/start, configuration menu access and navigation, operating mode selection, display options selection, tube info data, and reverse direction.

i. Provide a multi-color LCD touchscreen display for menu driven configuration settings, pump output value, service alerts, tube failure detection (TFD) system and flow verification system (FVS) alarms status, remote input signal values, tubing life timer value. Display color shall be green when indicating run operation, blue when in idle, yellow when in stand-by, and red to indicate an alarm condition exists.

j. Provide for remote stop/start pump via non-powered contact closure loop.

k. Provide a user selectable 4-20mA and 0-1,000Hz output signal which are scalable and proportional to pump output volume.

l. Provide four contact closure alarm outputs. Three rated at 1A-115VAC, 0.8A-30VDC and one rated at 6A-250VAC, 5A-30VDC. Each alarm output shall be assignable to monitor any of the following pump functions: TFD system, FVS system, motor run/stop, motor failed to respond to commands, motor is running in reverse, general alarm (TFD, FVS, and/or motor over current), input signal failure, output signal failure, remote/local control status, revolution counter (tube life) set-point, or monitor which of the nine different pump operating modes is currently active.

m. Provide a four-digit password protected configuration menu.

n. Provide a flow verification system with programmable alarm delay time from 1-1000 seconds. FVS system shall monitor the FVS flow sensor while pump is running only. System shall not monitor pump while not running.

2.06 FLOW VERIFICATION SENSOR

1. Flow verification sensor shall output high-speed digital pulse signal or 4-20 mA, while pump is running only, to verify chemical injection.

2.07 SAFETY

A. The pump shall be certified to NSF Standard 61 Drinking Water System Components, UL standard 778 motor operated pump and CSA standard C22.2 process control equipment.

B. Manufactured to ISO 9001:2015 requirements and processes.

C. Tube Failure Detection (TFD) system sensors shall be wholly located in the pump head. TFD system will stop the pump within three seconds of leak detection. To prevent false alarms due to rain, wash-down, condensation, etc., tube failure detection system shall not trigger with water contact. Process fluid waste ports or leak drains shall not be provided.

D. Pump head cover shall include an imbedded magnetic safety interlock which will stop the pump when removed. Pump rotor speed shall be limited to 6 RPM when cover is removed.

E. Secondary user confirmation input required for motor reversal, tube life revolution count reset, and factory default configuration reset.

2.08 MANUFACTURER

A. The pump shall be:

1. Blue-White, FLEXFLO M4 Peristaltic Metering Pump
2. Or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in a manner and to the tolerances recommended by the equipment manufacturer.

B. Check and align unit components.

C. Make all electrical connections in conformance with requirements of Division 16, Electrical.

3.02 START-UP AND FIELD TESTS

A. Contractor shall verify that structures, pipes and equipment are compatible.

B. Make adjustments required to achieve optimum operation.

C. Field test using job supplied flow meters and pressure gauges to demonstrate mechanical integrity and compliance with hydraulic performance criteria in this spec and with shop performance tests and vibration limitations. The tests shall demonstrate that the equipment operates in the manner intended.

D. Demonstrate that the completed installation meets specified requirements and that all controls and safety shutdowns are operational. Make adjustments required to place equipment in proper operating condition.

3.03 MANUFACTURER'S FIELD SERVICES

A. Retain factory trained pump and motor manufacturer's representatives with demonstrated ability and experience in the installation and operation of the pumps, and motors and accessories to perform the services listed below:

1. Provide technical assistance to Contractor during installation of pumping units.
2. Check alignment and inspect the installation prior to final grouting and start-up.
3. Assist in initial start-up, adjustments and field testing.
4. Instruct Owner's personnel in the operation and user maintenance of all components in accordance with the requirements of Section 01661, Instruction of Operations and Maintenance Personnel.
5. Supervise the correction of any defective or faulty Work before and after acceptance by Owner.

B. Perform all tests in the presence of the Engineer or the pump manufacturer's representative.

C. Submit report on pump performance from the pump manufacturer's representative.

END OF SECTION 11310

SECTION 11415

IN-LINE FLOW MEASURING SYSTEMS

PART 1 - GENERAL

1.01 WORK OF THIS SECTION

A. The Contractor shall provide in-line ultrasonic liquid flow measuring systems, complete and operable, in accordance with the Contract Documents.

1.02 CONTRACTOR / VENDOR RESPONSIBILITIES

A. References herein to the Contractor are intended to also refer to the equipment vendor as appropriate to implement the provisions of this specification and those of other section s of these contract documents regarding materials, installation, testing and warranty.

1.03 WARRANTY / GUARANTEE

A. Warranty Repairs: The Contractor shall be responsible for all necessary testing / calibration / repairs of the meter during at least a five (5) year period. The Contractor shall respond to the Owner's request for warranty repairs within 24 hours after notification by the Owner.

B. Guarantee: The meter shall continuously meet the specified accuracy and reliability requirements listed herein during this five (5) year warranty period. In regards to the signal strength requirement listed herein, the meter signal shall be held at all times that flow is occurring

1.04 RELATED SECTIONS

A. The Work of the following Sections applies to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of this Work.

Section 11001 General Requirements for Equipment

Section 16000 Requirements for Electrical Work

Section 17000 Instruments and Control

1.05 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Except as otherwise indicated, the current editions of the following apply to the Work of this Section:

ANSI/NCSL-2540-1	Calibration Laboratory and Measuring and Test Equipment General Requirements
ANSI B16.5	Pipe Fittings and Flanged Fittings, NPS 1/2 through NPS 24
ANSI/AWWA C207	Steel Pipe Flanges for Waterworks
ASTM B61	Specification for Steam or Valve Bronze Castings

1.06 CONTRACTOR SUBMITTALS

A. Shop drawings shall conform with the requirements of Section 01300 - Submittals, and Section 17000 - Instruments and Control.

PART 2 - PRODUCTS

2.01 TRANSIT-TIME ULTRASONIC FIELD MOUNTED LIQUID FLOW MEASURING SYSTEMS

A. General:

1. Ultrasonic field mounted meters shall be directional and use ultrasonic velocity measurement principles.

B. Wetted Components:

1. The meter body shall be PVDF.
2. The transducers shall be PEEK.
3. The end fittings shall be PVDF (optional PVC).
4. The o-ring seals shall be TFE/P (optional EP) and PVDF.
5. Shall not contain metal in the fluid path.

C. Control Circuitry:

1. All control circuitry shall be integral to the flow meter and capable of being field calibrated via Blue-Central user interface software.
2. Blue-Central:
    a. Shall connect to the meter via USB A-USB C cable to program and perform firmware updates.
    b. Shall automatically check for latest software updates when connected to the internet.
    c. Shall be compatible with Windows 7, 8, 10, and Mac (OSX 10.11/10.12/10.13)
    d. Shall allow for programming of outputs, setpoints, and error codes.
3. The meter shall provide a 4-20 mA output signal fully scalable across the entire range of the meter.
4. The meter shall provide a 0-10,000 Hz high-speed digital pulse output fully scalable across the entire range of the meter.
5. The meter shall provide a programmable Form C Solid State relay rated for a maximum load capacity of 100 mA at 24 VDC.
    a. Programmable for high/low flow rate alarm.
    b. Programmable to energize on specified flow total.
6. The meter shall provide a Pulse Output that will send a pulse each time the programmed total setpoint is reached.
7. A remote display shall be available as an added option.

8. Power Requirements: 5 VDC; 5 Watts maximum.

D. Flow Range:

Code	Flow Range (GPH)	Flow Range (LPH)	Flow Range (mL/min)
B	1.580-158.5	5.970-600.0	100-10,000

E. Accuracy:

1. User defined using the Calibration Setpoint feature within Blue Central and firmware for the meter. Once calibrated the meter shall be within +/- 0.25% at the field calibrated setpoint.
2. +/- 0.75% Full Scale Accuracy.

F. Enclosure:

1. Shall be composed of plastic components only. Circuit board and Terminal board shall be unexposed to surrounding environment.
2. Rated NEMA 4X (IP66)
3. Water tight gromets shall be provided to allow for connection of signal wires.
4. Cover screws shall be Stainless Steel.

G. Display:

1. Shall provide the flow rate, flow total readout, chemical profile, and meter status.
2. Shall be programmable in volume units of milliliters, liters, or gallons and time units of minutes, hours, or days.
3. Rated NEMA 4X (IP66) for both integral and remote display.
4. Integral display shall be of LED type and display meter condition.

H. Safety:

1. The flowmeter shall be certified to NSF/ANSI Standard 61 Drinking Water System Components.
2. Manufactured to ISO 9001:2015 Quality Management System requirements.

I. Manufacturer:

1. The meter shall be Sonic-Pro model MS-6 ultrasonic meter, manufactured in the U.S.A. by Blue-White Industries
2. Or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. In-line flow measuring systems shall be installed in conformance with the manufacturer's recommendations and per the requirements of the Contract documents.

3.02 MANUFACTURER AND/OR FACTORY REPRESENTATIVE SERVICES

A. Manufacturer and/or Factory Representative of the flow meter shall provide field supervision at the project site of the installation of the flow metering equipment. The Manufacturer and/or Factory Representative of the flow meter shall provide on-site programming of the flow meter, installation check and commissioning of the flowmeter.

3.03 ORIENTATION OF USER'S PERSONNEL

A. The manufacturer and/or Factory Representative of the flow meter shall provide a minimum of one-half (½) day for operator orientation and instruction on the operation of the flowmeter consecutive with the installation of the flow meter, in addition to other services provided per the requirements herein.

END OF SECTION 13315

SECTION 11430

CHEMICAL FEED SYSTEMS

PART 1 - GENERAL

1.01 SCOPE

A. Contractor shall furnish all labor, materials, equipment and incidentals required to supply, modify, install, test and place in satisfactory operation for chemical feed systems for sodium hypochlorite as indicated on the Drawings.

1.02 EQUIPMENT LIST

A. The major items of equipment covered under this section include but is not necessarily limited to the equipment listed below.

Pump No.	Description
11-WEP-005	Chemical Skid No. 1
11-PMP-005	Sodium Hypochlorite Feed Pump No. 1
11-FM-005	In-Line Chemical Flow Meter No. 1
11-WEP-005	Chemical Skid No. 2
11-PMP-005	Sodium Hypochlorite Feed Pump No. 2
11-FM-005	In-Line Chemical Flow Meter No. 2

1.03 QUALITY ASSURANCE

A. All equipment shall be new and of current manufacture. The chemical metering pump Manufacturer shall be the primary source of information on all equipment and material that they furnish for the job.

1.04 RELATED SECTIONS

A. Section 11001, General Equipment Provisions

B. Section 11330, Peristaltic Metering Pump

C. Section 11415, In-Line Flow Measuring Systems

D. Div 16, Electrical

E. Div 17, Instrumentation.

1.05 REFERENCE STANDARDS

A. The work in this section shall comply with applicable provisions and recommendations of the following standards, except as otherwise shown or specified:

1. American Gear Manufacturer's Association (AGMA)

2. American National Standards Institute (ANSI)
3. American Society of Civil Engineers (ASCE)
4. American Society of Mechanical Engineers (ASME)
5. American Society for Testing and Materials (ASTM)
6. American Welding Society (AWS)
7. American Water Works Association (AWWA)
8. Anti-Friction Bearing Manufacturer's Association (AFBMA)
9. Hydraulic Institute (HI)
10. Institute of Electrical and Electronic Engineers (IEEE)
11. Insulated Power Cable Engineer's Association (IPCEA)
12. National Association of Corrosion Engineers (NACE)
13. National Electric Code (NEC)
14. National Electrical Manufacturer's Association (NEMA)
15. National Fire Protection Association (NFPA)
16. National Sanitation Foundation (NSF)
17. Standard Specifications for Public Works Construction (SSPWC, "Greenbook"), latest edition
18. Underwriter's Laboratory (UL)

1.06 CONTRACTOR SUBMITTALS

A. Shop drawings shall conform with the requirements of Section 01300 - Submittals, and Section 17000 - Instruments and Control.

PART 2 - PRODUCTS

2.01 GENERAL

A. Install complete chemical metering pump systems as specified in this section and as shown on the contract drawings.

2.02 SKID

A. The packaged system is to be supplied with a Chemically Resistant Polyethylene Structure that all related equipment, piping and appurtenances, and accessories shall be mounted on.

B. Mounting Position:
1. Mounting position shall be Floor mounted.

2.03 PIPING

A. The packaged system is to be supplied complete with suction and discharge piping and accessories as described herein.

B. The suction piping shall be sized to provide adequate NPSH to the pumps.

C. Pressure relief valves shall be provided on the pump discharges to protect the pumps from excessive backpressure or dead-head conditions.

D. A by-pass line shall run from the pressure relief valves back to the suction line. The by-pass line shall include an isolation valve.

E. Isolation valves shall be provided on the suction and discharge of the pumps for ease of maintenance.

F. All piping shall be PVC pipe.

G. All ball valve shall be vented.

H. All ball valves shall be true union type with PVC body, PTFE shaft bearings and seats.

2.04 PUMP

A. Provide chemical metering pump in accordance with Section 011330, Peristaltic Metering Pump.

2.05 ACCESSORIES

A. The chemical metering pump systems shall include the following accessories:

1. Calibration Cylinder: The calibration cylinder shall be piped to the suction line and is to include an isolation valve. Column shall be direct reading in GPH and sized to allow at least a 30-second drawdown at the design capacity of the pump. Column shall be glass and all wetted materials are to be compatible with the chemical to be pumped.
2. Flow Meter: An ultrasonic flow meter shall be provided in accordance with Section 11415, In-Line Flow Measuring Systems.
3. Flow Verification Sensor: Not Required
4. Pressure Relief Valve: A pressure relief valve shall be provided at the discharge of each pump. The relief valve setting shall be set at a pressure lower than the pump internal relief valve. Valve wetted materials are to be compatible with the chemical to be pumped.
5. Back Pressure Valve: Not Required
6. Pressure Indicator: A pressure liquid-filled gauge with stainless steel case shall be provided in the discharge piping common line. The gauge shall be sized at least 25% higher than the pump internal relief valve set pressure. Provide ball valves and diaphragm seal for process isolation. Wetted material shall be CPVC, diaphragm shall be Kalrez 2037. Pressure gauges shall be manufactured by Ashcroft Inc., or approved equal.
7. Pulsation Dampener: Not Required
8. Flow Indicator: Machined cast acrylic, PVC connections, ceramic ball, PVDF balls top, PVC half unions.
9. Drip Tray: A 4-inch deep polyethylene drip tray
10. Check Valve: PVC body check valves shall be included in each pump discharge line. Maximum working pressure at inlet = 150psi, maximum working backpressure = 100 psi. All pump discharge isolation valves must be fully open.

2.06 CONTROLS

A. The chemical metering pump systems shall be provided with all necessary controls including motor starters and properly sized overload protection. The only required field electrical connection shall be the power supply. An ON-OFF switch and indicating light will be provided for each pump motor. All electrical components will be housed in a NEMA 4X enclosure. All wiring from electrical devices to the control panel will be run through conduit

B. Controls shall also be in accordance with Section 11330, Peristaltic Metering Pump.

2.07 SPARE PARTS

A. Supply the following spare parts and accessories:

1. Two (2) spare tubes for each tubing type.
2. One (1) spare roller assembly for each pump type.

2.08 MANUFACTURER

A. The Chemical Feed System shall be:

1. Blue-White, CHEM-FEED Plastic Single Skid System CFPS-1-M
2. Or approved equal.

PART 3 - EXECUTION

3.01 GENERAL

A. Contractor shall install and mount the equipment in accordance with the manufacturer's written instructions and as called for on the Drawings and in these Specifications.

B. Contractor shall connect all piping, wiring, and controls to equipment.

C. Contractor shall receiving, unload, handle, install, test, and startup the equipment per the supplier requirements.

END OF SECTION

SECTION 11500

EYEWASH/SAFETY SHOWER STATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Emergency eyewash and safety shower station.

1.02 REQUIREMENTS

A. The CONTRACTOR shall furnish and install all plumbing fixtures specified herein and in combination with Work prescribed in other sections of the Contract Documents, to provide a complete and finished plumbing system in accordance with the requirements of the Contract Documents.

1.03 RELATED REQUIREMENTS

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

1. Section 01300, Submittal Procedures; Section 09900, Painting and Coating; Section 15050, General Piping Requirements.

1.04 REFERENCES

A. All Work specified herein shall conform to or exceed the applicable requirements of the referenced portions of the following publications to the extent that the provisions thereof are not in conflict with other provisions of the Specifications. Reference shall be made to the latest edition of said standards unless otherwise called for.

B. Comply with the applicable editions of the following codes, regulations, and standards.

1. Codes and Regulations:

CCR California Code of Regulations, Title 24, Part 5, California Plumbing Code

C. Certified by CSA to meet the ANSI Z358.1 Standard for Emergency Eyewash and Shower Equipment.

D. Comply with the applicable reference specifications as directed in the General Requirements and Additional General Requirements.

1.05 SUBMITTALS

A. Submittals shall be made in accordance with the General Requirements, Additional General Requirements and as specified herein.

1.06 PIPE SCHEDULE

A. Refer to the Drawings for the Pipe Schedule.

1.07 VALVES

A. Contractor is responsible for providing valves based on the manufacturer's recommendation.

1. The valve schedule includes tag number, location, valve type, operator, valve size and valve material, comments on installation, service, and pressure ratings.

1.08 QUALITY CONTROL

A. Eye/face wash and safety shower station and valve assembly are pre-built and fully water/pressure tested to ensure no leaks and proper function which ultimately reduces installation time.

B. The manufacturer of the eyewash and safety shower station and appurtenances shall have 10 years' experience in the manufacture of the valves and appurtenances they intend to supply.

1. The manufacturer must be well established, reputable, and qualified in the opinion of the City.

2. The City may choose to limit the manufacturers permitted to supply particular valves and appurtenances to one or more manufacturers due to the City's operation and maintenance concerns.

C. Eyewash and safety shower station and appurtenances of the same type shall be the product of one manufacturer.

D. Eyewash and safety shower station and appurtenances shall be new and of current manufacture.

E. Eyewash and safety shower station and appurtenances shall conform with the service and pressure ratings listed in the Valve Schedule.

1. When not listed, the Contractor shall ascertain appropriate information.

F. All coatings and lubricants in contact with potable water shall be NSF 61 certified.

1.09 WARRANTY

A. Each supplier shall warranty their materials and workmanship for a period of 24 months (from acceptance by the City) against material and fabrication defects.

B. During the warranty period, the Contractor shall provide the services of a trained manufacturer's representative to make necessary adjustments, repairs and replacements of defective materials, valves or appurtenances to maintain the original functioning of the valves at no cost to the City.

1.10 OPERATION AND MAINTENANCE INFORMATION

A. Operation and maintenance manuals, spare parts and instructions of City personnel are required for all valves and appurtenances.

1. The Contractor's submittal for each valve or appurtenance shall list in detail the operation and maintenance information that the Contractor will provide.

2. The Contractor's submittal for each valve or appurtenance shall list in detail the instructions of City personnel by the on-site services of a trained manufacturer's service representative.

B. Special tools, if required for normal operation and maintenance, shall be supplied with the valves and appurtenances.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. All plumbing piping, fixtures, specialties, equipment, etc., shall be new, highest grade products manufactured for the intended usage. Materials, capacities, features, finishes, and manufacturers shall be as specified herein and shall be compatible with elements of the Work to which they relate or connect.

B. All plumbing fixtures shall be new, without flaws, with white finish unless otherwise shown. All exposed brass, faucets, wastes, traps, etc., shall be chrome plated. Each fixture shall be provided with individual stops and shall be anchored firmly to the building wall or floor. All other plumbing equipment like softeners, water heaters, lab equipment, etc., shall have drains and isolating valves on each side.

2.02 FIXTURE SCHEDULE

A. The emergency drench showers, not subject to freezing, with shower head, self-closing manual valve, handle, eye wash with stainless steel bowl and galvanized drain, and 1-1/4-inch supply; shall be HAWS Model No. 8300 or approved equal.

B. Manufacturers:

1. Haws or approved equal.

C. Combination of shower and eye/face wash shall include a stainless steel 11" (27.9 cm) round bowl, eye/face wash head shall feature inverted directional laminar flow which achieves Zero Vertical Velocity supplied by an integral 3.7 gpm flow control. Unit shall also include the AXION MSR hydrodynamic designed ABS plastic showerhead with 20 gpm flow control, chrome-plated brass stay-open ball valve equipped with stainless steel ball and stem, and chrome-plated brass in-line 50 x 50 mesh water strainer. Unit shall also include Schedule 40 hot-dipped galvanized steel pipe and fittings, powder-coated cast-iron 9" (22.9 cm) diameter floor flange, self-adhesive high visibility safety green and bright yellow stripes, universal sign, and 1-1/4" NPT supply.

PART 3 - EXECUTION

3.01 GENERAL

A. Eyewash and safety shower station shall be installed in accordance with the manufacturer's recommendations and as shown on the Drawings.

1. The Contractor shall provide the services of a trained manufacturer's representative to make all necessary adjustments, repairs or replacements of valves or appurtenances.

B. Handling and cleaning.

1. Eyewash station shall be delivered and stored in accordance with the manufacturer's recommendations.
2. Eyewash shall remain in factory packaging until ready for installation.
3. Refer to Section 15051, "General Piping Requirements" for requirements.

C. Corrosion protection.

1. Refer to the Drawings for the use of corrosion control materials and equipment.

D. Identification of valves and appurtenances.

1. Eyewash station is assigned a tag number per Drawings.
    a. The Contractor shall permanently affix the tag number on or near the eyewash station.

3.02 INSTALLATION

A. Each fixture and piece of equipment requiring connections to the sanitary drainage system shall be equipped with a trap, easily removable for servicing and cleaning, unless indicated otherwise on the Contract Documents. Traps shall be supplied with the fixtures. Each trap shall be placed as near to the fixture as possible, and no fixture shall be double trapped. Traps installed on bell and spigot pipe shall be extra-heavy cast iron, and traps installed on threaded pipe shall be recessed drainage pattern or as specified with the fixture.

B. Each fixture shall be vented in accordance with the applicable plumbing code.

C. The CONTRACTOR shall provide chrome-plated rigid or flexible supplies to fixtures with angle stops, reducers, and escutcheons.

D. All components shall be installed level and plumb. Supplies and wastes shall be centered.

E. All fixtures shall be installed and secured in place with wall supports and bolts.

F. All fixtures shall be mounted to the following heights above finished floor: Emergency Eye Wash:

1. Standard 38 in. (965 mm) to receptor rim
2. Emergency Shower:
3. Standard 84 in. (2130 mm) to bottom of head

3.03 ADJUSTING AND CLEANING

A. Stops or valves shall be adjusted for intended water flow rate to fixtures without splashing, noise, or overflow.

B. At completion, the CONTRACTOR shall clean all plumbing fixtures and equipment.

END OF SECTION

SECTION 13000
INSTRUMENT AND CONTROL SYSTEM

PART 1 GENERAL

1.1 SYSTEM DESCRIPTION

A. This Section gives general requirements for the instrument and control system (I&CS) which includes primary elements and transmitters, analog display and control elements, discrete display and control elements, control panels, and associated devices.

1.2 RELATED SECTION

A. Section 13470 SCADA PROGRAMMABLE LOGIC CONTROLLER SYSTEM
B. Division 16 Electrical sections

1.3 SUBMITTALS

A. Shop Drawings

Shop drawing submittals shall be neatly arranged in 3-ring binders which may have pockets for full-size drawings folded and CD. Tabs shall be used to separate individual items in the submittal. Loose submittals without a binder shall be rejected without review. Deviations if any from the specifications shall be summarized and tabulated on a separate document pages titled “Notes to Reviewer”. Shop drawings that do not follow the required format shall be rejected without being reviewed.

1. Bill of Materials: List of required I&CS equipment.

    a. Group equipment items by common enclosure, and equipment type.
    b. Data Included:

        1) Equipment tag number.
        2) Description.
        3) Manufacturer, complete model number and all options not defined by model number.
        4) Quantity supplied.

2. Catalog Cuts: I&CS Components, Electrical Devices, and Mechanical Devices:

    a. Catalog information.
    b. Descriptive literature.
    c. External power and signal connections.
    d. Scaled drawings showing exterior dimensions and locations of all electrical and mechanical interfaces.

3. Component Data Sheets: Data sheets for all I&CS components.

a. Format and Level of Detail in accordance with ISA-S20.
b. Specific features and configuration data for each component:

1) Location or service.
2) Manufacturer and complete model number.
3) Size and scale range.
4) Set points.
5) Materials of construction.
6) Options included.

c. Name, address, and telephone number of manufacturer's local office, representative, distributor, or service facility.

4. Panel Construction Drawings:

a. Scale Drawings: Show location of panel mounted devices, doors, louvers, and subpanels.

b. Panel Legend: List front of panel devices by tag numbers, nameplate inscriptions, service legends, and annunciator inscriptions.

c. Bill of Materials: List devices mounted within panels that are not listed in panel legend. Include tag number, description, manufacturer, and model number.

d. Construction Details: NEMA rating, materials, material thickness, structural stiffeners and brackets, lifting lugs, mounting brackets and tabs, door hinges and latches, and welding and other connection callouts and details.

e. Construction Notes: Finishes, wire color schemes, wire ratings, and wire numbering and labeling scheme.

5. Interconnection Diagrams: For discrete control and power circuits.

a. Diagram Type: Ladder diagrams in a format similar to those shown on Drawings. Include devices requiring electrical connections. Show unique rung numbers on left side of each rung where applicable.

b. Item Identification: Identify each item with attributes listed.

1) Wires: Wire number and color. Cable number if part of multiconductor cable.
2) Terminals: Location (enclosure number, terminal junction box number, or MCC number), terminal strip number, and terminal block number.
3) Discrete Components:

a) Tag number, terminal numbers, and location ("FIELD", enclosure number, or MCC number).

b) Switching action (open or close on rising or falling process variable), set point value and units, and process variable description.

4) Relay Coils:

a) Tag number and its function.
b) On right side of rung where coil is located, list contact location by ladder number and sheet number. Underline normally closed contacts.

5) Relay Contacts: Coil tag number, function, and coil location (ladder number and sheet number).

a) Show each circuit individually. No "typical" diagrams will be allowed.
b) Ground wires and connections.
c) Circuit Names: Show names corresponding to Circuit and Raceway Schedule for circuits entering and leaving a panel. Refer to Division 16, ELECTRICAL.

6. Loop Diagrams: Individual wiring diagram for each analog or pulse frequency loop.

a. Loop diagrams similar to ISA format or one preferred by CITY.

b. Conform to the minimum requirements of ISA S5.4.

c. Under paragraph 5.3 of ISA S5.4, include the information listed under subparagraphs 2, 5, 6 and 9.

d. Drawing Size: Individual 11-inch by 17-inch sheet for three loops maximum. Loop drawings smaller than 11” x 17” will be rejected without review.

e. Divide each loop diagram into areas for field panel, field, terminal junction boxes, control panel and PLC.

f. Show:

1) Terminal numbers, location of DC power supply, and location of common dropping resistors.
2) Switching contacts in analog loops and output contacts of analog devices. Reference specific control diagrams where functions of these contacts are shown.
3) Tabular summary on each diagram:

a) Transmitting Instruments: Output capability.
b) Receiving Instruments: Input impedance.

4) Circuit and raceway schedule.

7. Panel Power Requirements and Heat Dissipation: For control panels tabulate and summarize:

   a. Required voltages, currents, and phases(s).

   b. Maximum heat dissipations Btu per hour.

   c. All calculations.

8. Termination Wiring Diagrams:

   a. Diagrams, device designations, and symbols in accordance with NEMA ICS 250.

   b. Show:

      1) Electrical connections between equipment, consoles, panels, terminal junction boxes, and field mounted components.
      2) Component and panel terminal identification numbers, and external wire and cable numbers.
      3) Circuit names matching Circuit and Raceway Schedules.
      4) Intermediate terminations between field elements and panels for, but not limited to terminal junction boxes and pull boxes.

9. Installation Details: Provide installation details and bill of materials required for the proper installation of AS Components.

10. Spares, expendables, and test equipment.

B. Samples: Color schedule with color samples for control panels.

C. Quality Control Submittals:

   1. Testing Related Submittals: In accordance with this Section

   2. O&M Manuals:

      a. Refer to paragraph Shop Drawings for the following items:

         1) Bill of Materials.
         2) Catalog Cuts.
         3) Component Data Sheets.
         4) Interconnection Diagrams, one reproducible copy.
         5) Loop Diagrams, one reproducible copy.
         6) Termination Wiring Diagrams, one reproducible copy.

      b. Device O&M manuals for I&CS components, electrical devices, and mechanical devices shall include:

1) Operations procedures.
2) Installation requirements and procedures.
3) Maintenance requirements and procedures.
4) Troubleshooting procedures.
5) Calibration procedures.
6) Internal schematic and wiring diagrams.
7) ORT Component and Calibration Sheets.
8) List of required test equipment.

c. List of spares and expendables required and recommended.

1.4 DELIVERY, STORAGE, AND HANDLING

A. In accordance with this Section.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Standard Environmental Requirements: Unless otherwise noted, instrumentation equipment shall be suitable for continuous operation in these environments:

1. Inside (pump station building):

a. Temperature: 20 to 115 Deg. F.
b. Relative humidity: 10 to 95% non- condensing.
c. NEC classification: Non-hazardous.

2. Outside:

a. Temperature: -32 to 120 Deg. F.
b. Rain
c. NEC classification: Non-hazardous.

B. Furnish and provide I&CS components and panels for continuous operation in its operating environments as shown and located on the Drawings. All equipment shall be suitable and designed for installation as per California Building Code regarding seismic requirements and compliance.

1.6 SEQUENCING AND SCHEDULING

A. In accordance with the CITY general construction schedule.

1.7 MAINTENANCE

A. Spares Parts:

Provide the following spare parts with no additional cost to the CITY. See section 13470 for additional spare parts for PLC system.

Description	Percent of Each Type and Size Used	No Less Than
Fuses	20	5
Indicating light bulbs	20	10
Relays	2	2
Terminal Blocks	10	5
Hand Switches	2	2

B. Expendables: None

1.8 WARRANTY

A. The Contractor shall provide a written warranty covering the performance, workmanship, and installation of all equipment furnished under this Section for a period of two (2) years. The Contractor shall assume responsibility for all costs incurred in achieving satisfactory performance during the warranty period. Warranties shall be in accordance with these specifications.

PART 2 PRODUCTS

2.1 TEST EQUIPMENT AND TOOLS

Contractor shall provide the following tool to the CITY for no additional cost.

Equipment	Quantity	Manufacturer and Model number
Termination kit	1	Jensen Tools Model JTK-23B210

2.2 I&CS COMPONENTS

A. Components for Each Loop: Components for each loop shall be listed in ISA-format Data Sheets. Furnish all equipment that is necessary to achieve required loop performance.

2.3 NAMEPLATES AND TAGS

A. Panel Nameplates: Enclosure identification located on the enclosure face.

1. Location and Inscription: As shown on panel Drawing.

2. Materials: 16-gauge, Type 316, stainless steel, stamped, mounted with stainless steel screws.

3. Letters: 1/2-inch, unless otherwise noted.

B. Component Nameplates-Panel Face: Component identification located on panel face under or near component.

1. Location and Inscription: As shown on panel Drawing.

2. Materials: Adhesive backed laminated plastic.

3. Letters: 3/16-inch white on black background, unless otherwise noted.

C. Component Nameplates-Back of Panel: Component identification located on or near component inside of enclosure.

1. Inscription: Component tag number.

2. Materials: Adhesive back, laminated plastic.

3. Letters: 3/16-inch white on black background, unless otherwise noted.

D. Service Legends: Component identification nameplate located on face of component.

1. Inscription: As shown on panel Drawing.

2. Materials: Adhesive backed laminated plastic.

3. Letters: 3/16-inch white on black background, unless otherwise noted.

E. Nametags: Component identification for field devices.

1. Inscription: Component tag number.

2. Materials: 16-gauge, 316 stainless steel.

3. Letters: 1/4-inch imposed.

4. Mounting: Affix to component/field instruments with 16- or 18-gauge stainless steel wire or stainless steel screws.

2.4 PANEL FABRICATION

A. General:

1. Panels with external dimensions and instruments arrangement as shown on Drawings except as modified in Engineer approved shop drawings.

2. Panel Construction and Interior Wiring: In accordance with the National Electrical Code (NEC), state and local codes, and applicable sections of NEMA, ANSI, UL, and ICECA.

3. Fabricate panels, install instruments, wire, and plumb, all at the ICS subcontractor's factory.

4. All panels shall be UL listed and shall bear UL label stating "LISTED ENCLOSED INDUSTRIAL CONTROL PANELS". (UL508)

5. Electrical Work: In accordance with the applicable requirements of Division 16, ELECTRICAL.

B. Temperature Control:

1. Smaller Panels (that are not freestanding): Size to adequately dissipate heat from equipment mounted inside panel or in panel face.

2. Provide all panels located in areas that are not climate controlled with thermostatically controlled strip heaters, except where there are no electronics or moisture-sensitive devices in the enclosure.

C. Panel Construction:

1. Materials: Sheet steel unless otherwise shown on Drawings with minimum thickness of 10-gauge. For NEMA 4X, 316 stainless steel shall be used.

2. Panel Fronts:

a. Fabricated from a single piece of sheet steel unless otherwise shown on Drawings.
b. No seams or bolt heads visible when viewed from front.
c. Panel Cutouts: Smoothly finished with rounded edges.
d. Stiffeners: Steel angle or plate stiffeners or both on back of panel face to prevent panel deflection under instrument loading or operation.

3. Internal Framework:

a. Provide structural steel for instrument support and panel bracing.
b. Permit panel lifting without racking or distortion.

4. Lifting rings to allow simple, safe rigging and lifting of panel during installation.

5. Adjacent Panels: Securely bolted together so front faces are parallel.

6. Doors:

a. Full height, fully gasketed access doors where shown on Drawings.
b. Key lockable.
c. Latches: Three-point, Southco Type 44 or equal.
d. Handles: "D" ring, foldable type.
e. Hinges: Full length, continuous, piano type, steel hinges with stainless steel pins.

f. Rear Access Doors: Extend no further than 24 inches beyond panel when opened to 90-degree position.
g. Front and Side Access Doors: As shown on Drawings.
h. Provide a latch to hold door at full open position.

D. Non-Freestanding Panel Construction:

1. Based on environmental design requirements required and referenced in Article ENVIRONMENTAL REQUIREMENTS, provide the following:

a. For panels located inside where required and shown on the drawings:

1) Enclosure Type: NEMA 12.
2) Materials: Steel.

b. For all other panels:

1) Enclosure Type: NEMA 4X.
2) Materials: 316 SS.

2. Doors:

a. Oil resistant gasket sealed with continuous hinge.
b. Fiberglass lockable quick release latches.

3. Manufacturers:

a. Hoffman or equal.

E. Control Panel Electrical and control components:

Control panel shall be NEMA 4X stainless steel for outdoor installation and shall be NEMA 12 for indoor locations. Panels shall have the following features:

1. Power Distribution, motor starter within panels:

a. Feeder Circuits and motor starters:

1) One or more 120V ac, 60-Hz feeder circuits as shown on Drawings.
2) Make provisions for feeder circuit and starter conduit entry.
3) Furnish terminal board for termination of wires.

b. Power Panel: Furnish main circuit breaker and a circuit breaker on each individual branch circuit distributed from power panel.

1) Locate to provide clear view of and access to breakers when door is open.
2) Breaker sizes: Coordinate such that fault in branch circuit will blow only branch fuse but not trip the main breaker.

3) Breaker and motor starter manufacturers and products:

a) Refer to Division 16, ELECTRICAL.

2. Signal Distribution:

a. Within Panels: 4 to 20 mA dc signals (may be distributed as 1 to 5V dc with a precision 250 OHM resistor).

b. Outside Panels: Isolated 4 to 20 mA dc only.

c. All signal wiring shall be twisted, shielded pairs, minimum 16 AWG.

3. Signal Switching:

a. Use dry circuit type relays or switches.

b. No interruption of 4 to 20 mA loops during switching.

c. Switching Transients in Associated Signal Circuit:

1) 4 to 20 mA dc Signals: 0.2 mA, maximum.
2) 1 to 5V dc Signals: 0.05V, maximum.

4. Relays:

a. General:

1) Relay Mounting: Plug-in type socket.
2) Relay Enclosure: Furnish dust cover.
3) Socket Type: Screw terminal interface with wiring.
4) Socket Mounting: Rail.
5) Provide holddown clips.

b. Signal Switching Relay:

1) Type: Dry circuit.
2) Contact Arrangement: 4 Form C contacts.
3) Contact Rating: 0 to 5 amps at 28V dc or 120V ac.
4) Contact Material: Gold or silver.
5) Coil Voltage: As noted or shown.
6) Coil Power: 0.9 watts (dc), 1.2VA (ac).
7) Expected Mechanical Life: 10,000,000 operations.
8) Expected Electrical Life at Rated Load: 100,000 operations.
9) Indication Type: LED indicator lamp.
10) Seal Type: Hermetically sealed case.
11) Manufacturer and Product: Potter and Brumfield; Series KH/KHA, Idec equivalent, or equal.

c. Control Circuit Switching Relay, Nonlatching:

1) Type: Compact general purpose plug-in.
2) Contact Arrangement: 3 Form C contacts.
3) Contact Rating: 10A at 28V dc or 240V ac.
4) Contact Material: Silver cadmium oxide alloy.
5) Coil Voltage: As noted or shown.
6) Coil Power: 1.8 watts (dc), 2.7VA (ac).
7) Expected Mechanical Life: 10,000,000 operations.
8) Expected Electrical Life at Rated Load: 100,000 operations.
9) Indication Type: Neon or LED indicator lamp.
10) Push to test button.
11) Manufacturer and Product: Potter and Brumfield; Series KUP, Idec equivalent, or equal.

d. Control Circuit Switching Relay, Latching:

1) Type: Dual coil mechanical latching relay.
2) Contact Arrangement: 2 Form C contacts.
3) Contact Rating: 10A at 28V dc or 120V ac.
4) Contact Material: Silver cadmium oxide alloy.
5) Coil Voltage: As noted or shown.
6) Coil Power: 2.7 watts (dc), 5.3VA (ac).
7) Expected Mechanical Life: 500,000 operations.
8) Expected Electrical Life at Rated Load: 50,000 operations.
9) Manufacturer and Product: Potter and Brumfield; Series KB/KBP, Idec equivalent, or equal.

e. Submersible pumps thermal and leak detection relays:

Refer to Section 11312- Submersible Mixer for detailed requirements. Relays shall be manufactured by Flygt Model CAS II, Goulds Pumps equivalent, or equal.

f. Signal conditioners/splitters:

Signal conditioners shall be manufactured by AGM Electronics, Phoenix Contact, or equal. They shall have the following characteristics:

1) Din rail mounted
2) 24VDC power input or two wire as required by design loop drawings.
3) 4-20mADC input with two identical 4-20mADC outputs or
4) Pulse input with 4-20mADC output or
5) 4-20mADC input with isolated 4-20mADC output

g. Intrinsically safe relays:

Where shown and required, these relays shall be suitable for use with 120VAC power input with pilot devices such as float switches located in the classified hazardous locations as defined by NEC Article 500. Each

relay shall have two double-pole double throw contacts, each rated for 5 amperes at 240V. These relays shall be manufactured by Consolidated Electric, Gem Sensors, R. Stahl, Inc, or equal.

5. Centralized Power Supplies:

   a. Furnish as required where shown on the drawings to power instruments requiring external dc power, including two-wire transmitters and dc relays.

   b. Convert 120V ac, 60-Hz power to dc power of appropriate voltage(s) with sufficient voltage regulation and ripple control to assure that instruments being supplied can operate within their required tolerances.

   c. Furnish redundant dc power supplies connected in such a way that DC output power is uninterrupted when one power supply is removed or is not delivering the correct output voltage.

   d. Provide a contact closure for alarm in case of dc power supply failure.

   e. Provide a voltmeter for each power supply.

   f. Provide output over voltage and over current protective devices to:

      1) Protect instruments from damage due to power supply failure.
      2) Protect power supply from damage due to external failure.

   g. Enclosures: NEMA 1.

   h. Mount such that dissipated heat does not adversely affect other components.
   Fuses: For each dc supply line to each individual two-wire transmitter.

      1) Type: Indicating.
      2) Mount so fuses can be easily seen and replaced.

   i. Manufacturer and Products: Acopian Redundant Power Packages, Sola equivalent, or equal.

6. Standard Pushbutton Colors and Inscriptions:

   a. Use following color code and inscriptions for pushbuttons unless otherwise noted:

Tag Function	Inscription(s)	Color
OO	ON OFF	Red Green

Tag Function	Inscription(s)	Color
OC	OPEN CLOSE	Red Green
OCA	OPEN CLOSE AUTO	Red Green White
OOA	ON OFF AUTO	Green Red White
MA	MANUAL AUTO	Yellow White
SS	START STOP	Red Green
RESET	RESET	Red
EMERGENCY STOP	EMERGENCY STOP	Red
LOCAL	LOCAL	White

b. Unused or Noninscribed Buttons: Black.

c. Lettering Color:
   1) Black on white and yellow buttons.
   2) White on black, red and green buttons.

7. Standard Light Colors and Inscriptions:

a. Use following color code and inscriptions for service legends and lens colors for indicating lights, unless otherwise noted in Instrument List:

Tag Function	Inscription(s)	Color
ON	ON	Green
OFF	OFF	Red
OPEN	OPEN	Red
CLOSED	CLOSED	Green
LOW	LOW	Green
FAIL	FAIL	Red
HIGH	HIGH	Red
AUTO	AUTO	White
MANUAL	MANUAL	Yellow
LOCAL	LOCAL	White
REMOTE	REMOTE	Yellow

b. Lettering Color:
   1) Black on white lenses.
   2) White on red and green lenses.

2.5 SOURCE QUALITY CONTROL

A. Factory Demonstration Tests: Normally, the Contractor shall demonstrate satisfactorily to Engineer that I&CS panel and assemblies included in these tests for conformance to related submittals and requirements specified. These factory tests for this project are waived since all the work shall be done on site, and thus only on site functional and startup tests are required.

2.6 REQUIRED INSTRUMENTS FURNISHED AND INSTALLED BY CONTRACTOR

2.6.1 PRESSURE INSTRUMENTS

A. Pressure Switches and gauges:

1. General:

a. Function: Monitor differential pressure, and provide contact closure(s) when differential pressure is at the noted set point.
b. Type: Diaphragm actuated.

2. Performance:

a. Set Point: As noted.
1) Adjustable over the full range.
2) Set as noted.

b. Range: The noted set point shall fall between 30 and 70 percent of the range.

c. Set Point Repeatability: Plus or minus 1/2 percent of range span.

3. Features:

a. Diaphragm Materials: Buna-N, unless otherwise noted.
b. Pressure Connection: Nickel-plated brass, unless otherwise noted.

4. Enclosure: NEMA 4X, unless otherwise noted.

5. Signal Interface:

a. Contact Type: SPDT, snap action switch, rated for 5 amps at 120V ac.

6. Manufacturers:

a. Ashcroft, B Series.
b. United Electric, Series 300
c Mercoid, Series DP

B. Pressure Transmitter

1. General: Furnish and install transmitter where shown on the drawings.

a. Measure pressure by detecting force on an integral capacitance diaphragm capsule.

2. Performance:

a. Range: 0 to 125 psi, 0 to 10 psi respectively.
b. Provide zero elevation and adjustment.
c. Span shall be adjustable over 100 to 1 or greater range.
d. Adjustable damping shall be provided.
e. Wetted parts shall be 316SS unless otherwise specified.
f. Accuracy shall be ±0.25% of span.
g. Transmitter housing shall be rated explosion proof, NEMA 7.
h. Integtal LCD meter with the transmitter housing.
i. HART protocol
j. Two-valve SS manifold

3. Signal Interface:

a. Transmitter output: 4-20mA current regulated to drive any load between 0-750 ohms at 24V DC.
b. Transmitter: Two wire type (loop powered)

4. Manufacturers:

a. Rosemount 2051C
b. Foxboro, ABB
c. Equal

2.6.2 FLOW INDICATING TRANSMITTERS

A. Magnetic flow meters

1. General:

a. Measure flow by flange type low frequency electromagnetic element with DC pulse signal proportional to and linear with liquid flow rate.

2. Performance:

a. Range: 0 to 3700 gpm for 14”, 0 to 200 gpm for 0.5” respectively
b. Sensor: Minimum two bullet-nosed, self-cleaning electrodes
c. Meter housing hardware: NEMA 6 Submergence, epoxy painted
d. Sensor electrode: Hastelloy, Polyurethane liner, grounding rings for water and wastewater. Titanium, Neoprene liner, grounding rings for chemical such as sodium Hypochlorite.
e. Accuracy: 0.25% of full rate
f. Electronic transmitter with 4-20maDC output, 3-line, 16-character LCD Display and pulse/frequency for totalization signals. NEMA 4X enclosure, 120VAC input, HART protocol, sun shield.
g. Environment: 20 to 140 degrees F, humidity 90% non-condensing

h. Hand-held calibrator/programmer (shall be provided at no additional cost)

3. Manufacturers:

a. ABB Magmaster
b. Siemens
c. Equal

2.6.3 LEVEL MEASUREMENT

Furnish and install level transmitter where shown on the drawings.

A. Level transmitter (Ultrasonic type)

1. Continuous level measurement by soundwave

2. Characteristics:

a. Ultrasonic probe/sensor with 100 feet cable length
b. Remote level transmitter NEMA 4X with 4-20mADC output
c. Power input 120VAC
d. Local level transmitter, keypad type with engineering unit.
e. HART protocol
f. Ultrasonic level sensor with narrow beam. Sensor is located in hazardous Class 1 Div I locations.
g. Provided with required 316 SS mounting hardware, 316 SS brackets, SS supports, and cables.

3. Manufacturer:

a. Siemens Milltronics HydoRanger with Echomax XPS-15 sensor.
b. Pulsar
c. Equal

B. Level switches (float type)

There are quantity of floats shall be as shown on the drawings. Float switches required for this project, furnished and installed by the Contractor. Conduit from floats to control panel shall be 2” in diameter minimum.

Floats shall be non-mercury type switch completely sealed with water resistant, stainless steel ball with PVC outer jacket, suspended with submarine type cable. Contact shall be rated for 5 amps, 120VAC, complete with stainless steel mounting hardware such as supports. Floats shall be manufactured by Siemens Model B100 9G-EF with stainless steel mounting clips to match the City’s standards.

Installation of these floats shall be as shown on the drawings.

2.6.4 TOTAL Cl2 ANALYZERS

Total Cl2 Analyzers shall be suitable for use with sampling pumps with transmitters having the following characteristics:

a. Complete Online monitoring system with two main components: Auto-Chem chemistry module and electronic transmitter.
b. Have back-lit display (4-digit LCD display) module and PID control functions.
c. ETHERNET TCP/IP communication (RJ-45) as well as MODBUS (RS485) communication ports.
d. 120VAC 60Hz power input and 4-20mADC output – NEMA 4X enclosure (Polycarbonate)
e. Operating temperature 0 degrees C to 50 degrees C
f. Three SPDT auxiliary relay controls
g. Membrane gas sensor with 25ft cable
h. Accessories such as tubing to sample pump, hoses, panel-mount bracket kit, one package of membranes, one 120cc bottle of electrolyte, one 50gram container of KI, two reagent plastic bottles and brackets.
i. Manufacturer: ATI Model Q46H/79S to match existing installation.

2.6.5 FLOW SWITCHES (Paddle Type)

Paddle type flow switch shall be provided where shown on the drawings. The flow switch's paddle shall be made of 316 stainless steel which shall trigger a hermetically sealed contact used for local and remote alarm. The switch shall be suitable for use from ½" to 2-in water piping, and shall be manufactured by Omega, Dwyer, or equal.

PART 3 EXECUTION

3.1 GENERAL

A. Floor plan layout for I&CS components are diagrammatic and not intended to specifically define element locations or piping and tubing run lengths. Materials and installations shall be based on field measurements.

B. Coordinate Work with Division 11, EQUIPMENT and Division 15, MECHANICAL.

C. Wiring: Refer to this Section and Division 16, ELECTRICAL.

3.2 FIELD QUALITY CONTROL

A. Perform field verifications of existing control panels in which modifications and additions are required. New wirings and new terminal strips shall match existing installation. New terminal numbers shall not be duplicated with existing assigned numbers.

B. Perform functional tests to assure all devices are functional individually prior to system testing.

C. Perform final acceptance testing at the presence of the CITY's representative, the Engineer.

3.3 TRAINING

A. Operation: For CITY's operations personnel on operation of I&CS.

1. Training Session Duration: 1 instructor day.

2. Number of Training Sessions: 2

3. Location: Project site.

4. Content: Conduct training on loop-by-loop basis.

a. Loop Functions: Understanding of loop functions including interlocks for each loop.
b. Loop Operation: For example, adjusting process variable set points, AUTO/MANUAL control transfer, AUTO and MANUAL control, annunciator acknowledgement and resetting.
c. Interfaces with ICS Subsystems.

B. Maintenance Training:

1. Training Session Duration: 1 instructor day.

2. Number of Training Sessions: 2

3. Location: Project site.

4. Content: Provide training for each type of component and function provided.

a. Loop Functions: Understanding details of each loop and how they function.
b. Component calibration.
c. Adjustments: For example, device setup parameters, controller tuning constants, current switch trip points, and similar items.
d. Troubleshooting and diagnosis for and components.
e. Replacing lamps, chart paper, fuses.
f. AS components removal and replacement.
g. Periodic maintenance.

END OF SECTION

SECTION 13140

FIBERGLASS REINFORCED PLASTIC BUILDINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Freestanding, shop fabricated and assembled fiberglass reinforced plastic (FRP) insulated composite buildings/sheds/huts.

2. Include fasteners, anchors, doors and frames, vents, gasketing, lighting, and ventilation fan.

1.02 SYSTEM DESCRIPTION

A. Design Requirements:

1. Building shall conform to dimensions shown on Drawings or Buildings shall have outside dimensions of 8 ft wide by 6 ft deep with a height of 8 ft.

2. Building shall be water resistant, corrosion and chemical resistant, lightweight, and environmentally aesthetic. Filtered louvers shall be provided

3. Building shall be equipped with adequate interior lighting to allow for operator's to work on sampling and controls equipment in the fully-enclosed building. Light switch shall be mounted on same j-box with exhaust fan ON/OFF switch (NEMA 4X) installed on the exterior.

4. Building shall be equipped with one 120VAC GFI convenience receptacle.

5. Building shall be equipped with a single, standard sized door for access that allows for locking and unlocking with standard treatment facility keys.

6. Design to sustain superimposed loads for load combinations in accordance with ASCE 7-98.

   a. Design loads:

      (1) Dead load of building, live (snow) load, 35 psf, wind load, 25 psf, mechanical equipment.

   b. During installation of the composite FRP structure a concentrated load not exceeding 250 pounds may be placed on any portion of the roof. The concentrated load shall not be applied to the roof if other loads are present.

7. Stresses produced by specified load conditions shall be determined consistent with recognized methods of analysis.

8. Average R-value of assembled building shall be minimum of R-7.

9. Provide 800W 120VAC electric heater with adjustable thermostat type settings.

1.03 SUBMITTALS

A. Product Data:

1. Resin and glass manufacturers material specifications.

B. Shop Drawings:

1. Include plans and elevations, fabrication details indicating laminate thickness and section depths and widths, location of openings and equipment supports, size and location of anchor bolts, and gasketing details.

C. Submit in accordance with Section 01330.

1.04 QUALITY ASSURANCE

A. Buildings provided shall be end product of one manufacturer to achieve standardization for appearance. Manufacturer Qualifications: Building shall be manufactured and erected by firm with minimum of 5 yrs experience in structures of size and character specified. Provide 20-year warranty on materials and workmanship for the building.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store and protect on manufacturer's site, project site and during shipment and installation to prevent warping and fracturing.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Mekco, Shelter Works, or equal

2.02 LAMINATE MATERIALS

A. Resins, Gel Coat, Glass Reinforcing, Insulation.

2.03 MISCELLANEOUS MATERIALS

A. Concrete Anchors, Doors, Gasketing

B. Permanently fused building assembly yielding a watertight one-piece structure.

2.04 FABRICATION

A. Form individual segments on high gloss or matte molds ensuring consistent dimensions of finished parts. Cast each segment in one piece. Laminate shall consist of chopped roving impregnated with resin. Form panel flanges and perimeter anchoring flanges to the interior of the building.

B. Exterior color of the building shall be light gray. Interior color shall be off-white.

2.05 ASSEMBLY

A. Shop assemble complete building. Flanges between adjacent panels shall be factory bonded together with structural adhesive. Seal exterior edges of adjacent panels with color matched silicon sealant. Fit and bond appurtenances, formed separately, into openings cut in finished panel or integrally mold to panel. Bond attachments with glass fibers and resin from interior of panel. Resin seal cut or drilled edges.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine surface to receive building for acceptable installation conditions. Do not start installation unless acceptable conditions are provided.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instruction and approved submittals.

B. Install continuous neoprene gasket or ConSeal between perimeter anchoring flange and where panels rest on supporting structure. Resin seal cut or drilled edges. Repair damaged panels. Minimum spacing and edge distances of concrete anchors shall conform to requirements of Section 05500.

C. All wirings within the enclosure shall be in PVC schedule 40 conduits. Electrical wirings shall be terminated in a common NEMA 4X fiberglass J-box for connections to power 120V circuits by the Contractor.

SECTION 13425
CONTROL STRATEGIES

PART 1 GENERAL

1.01 DESCRIPTION

A. This Section includes Control Strategies for chemical systems. Control Strategies have references to mechanical equipment, instruments, hardwired functions, and PLC/OIS functions.

B. Control Strategies are included for existing systems and functions. These Strategies are provided for reference, to indicate the scope and complexity of existing systems and functions which shall remain operational through the course of the project.

C. Control Strategies are included for systems and functions to be furnished, installed, started up, tested, and commissioned under this project.

D. Programming of PLC and OIS (aka supervisory or graphical functions) described herein will be by ArcSine Engineering, the City's Programmer, as Owner-furnished services. The Contractor's organization shall allow for this work, and manage the project overall including scheduling allowances for Owner-furnished services.

1.02 RELATED SECTIONS

A. Section 13000 - Instrument and Control System.

B. Section 13470 – SCADA Programmable Logic Controller System.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. The facilities included in the project are designed with a programmable logic controller (PLC) based control system which provides chemical system monitoring and control and monitoring functions of the pumping equipment and associated auxiliary equipment.

B. Section 3.02 consists of existing Control Strategies. These are provided to illustrate the operational complexities of the existing systems, and for reference for planning of cutovers, testing, and commissioning.

C. Section 3.03 consists of new Control Strategies, which are the subject of this Contract.

3.02 EXISTING CONTROL STRATEGIES

The following Control Strategies are for existing functions.

WETLAND PUMP STATION

Revised 3/11/11 to add automatic shutdown of pumps directed to Polish Wetlands due to High- High or Low-Low Chlorine residual alarms at Polishing Wetlands (PLC8).

Revised 4/26/11 to lockout pumps while in Wetlands Discharge mode in PLC6.

Revised 4/16/13 to add optional flow mode which increases flow to the polishing wetlands to compensate for polishing wetlands pump station flow to tertiary filters.

A. REFERENCE:

1. Process Area: 11
2. P&ID's: 11N2, 11N3
3. PLC5
4. SCADA Screen: R11S1

B. MECHANICAL EQUIPMENT:

Tag Number	Equipment Name
11-WEP-001	Wetlands Pump No. 1
11-WEP-002	Wetlands Pump No. 2
11-WEP-003	Wetlands Pump No. 3
11-WEP-004	Wetlands Pump No. 4
11-VLV-001	Wetlands Pump Motorized Valve No. 1
11-VLV-002	Wetlands Pump Motorized Valve No. 2

C. INSTRUMENTATION EQUIPMENT:

Tag Number	Equipment Name
11-PI-1107	Pressure Gauge – Pump 1Discharge
11-PSH-1107	Pressure Switch – Pump 1 Discharge
11-XS-1107	Moisture Leak Detector – Pump 1
11-TSH-1107	Motor Temperature Switch – Pump 1
11-PI-1108	Pressure Gauge – Pump 2 Discharge
11-PSH-1108	Pressure Switch – Pump 2 Discharge
11-XS-1108	Moisture Leak Detector – Pump 2
11-TSH-1108	Motor Temperature Switch – Pump 2
11-PI-1113	Pressure Gauge – Pump 3 Discharge
11-PSH-1113	Pressure Switch – Pump 3 Discharge

11-XS-1113	Moisture Leak Detector – Pump 3
11-TSH-1113	Motor Temperature Switch – Pump 3
11-PI-1110	Pressure Gauge – Pump 4 Discharge
11-PSH-1110	Pressure Switch – Pump 4 Discharge
11-XS-1110	Moisture Leak Detector – Pump 4
11-TSH-1110	Motor Temperature Switch – Pump 4
11-FIT-1105	Flowmeter – Flow To Chlorine Contact Basin
11-FIT-1114	Flowmeter – Flow To Polishing Wetlands
11-LSLL-1100	Level Switch – Wetlands Pump Station Wetwell
11-LIT-1115	Level Transmitter – Wetlands Pump Station Wetwell
11-LIT-1202	Level Transmitter – Chlorine Contact Basin

D. SYSTEM OVERVIEW:

1. The Wetlands Pump Station has four submersible pumps, each having a variable-frequency drive. The station pumps Treatment Wetlands Pond 9 effluent into a common station discharge header. Two motorized valves and a manually operated valve in the station discharge header are used to direct the output of station pumps to two destinations, the Polishing Wetlands and the Chlorine Contact Basin. The flow to each destination is metered. A maximum of three pumps can be directed to the Chlorine Contact Basin, and two pumps to the Polishing Wetlands. Pumping to the Chlorine Contact Basin is permitted only when CCB Discharge Mode is selected at the OIS. When Wetlands Discharge Modes is selected, any pumps assigned to the Chlorine Contact Basin will be prevented from running in SCADA MANUAL or SCADA AUTO modes. Further, if any pump assigned to the CCB is determined to be ON in LOCAL mode, River discharge will be aborted.

2. Two pumps (located at either end of the discharge header) are dedicated to pump to a single destination as follows:

   a. Pump 11-WEP-001 – Polishing Wetlands
   b. Pump 11-WEP-004 – Chlorine Contact Basin

3. Two pumps may be dedicated to pump to either of two destinations as follows:

   a. Pump 11-WEP-002 – Polishing Wetlands or Chlorine Contact Basin
   b. Pump 11-WEP-003 – Chlorine Contact Basin or Polishing

   Wetlands This selection is made at the OIS.

4. Station pumps and motorized discharge header valves are normally operated in REMOTE-AUTO Mode under PLC control. In that mode, motorized discharge header valves are opened or closed to match the pump dedicated destinations described in paragraph 3 above. In addition, a prompt appears on the OIS to remind the operator as to the proper position of the manually operated discharge header valve.

5. When two pumps are dedicated to pump to a single destination, those pumps are

operated in a LEAD/LAG configuration when under REMOTE-AUTO control. When three pumps are dedicated to pump to a single destination, those pumps are operated in a LEAD/LAG1/LAG2 sequence when under REMOTE-AUTO control and pumping to the Chlorine Contact Basin. If three pumps are directed to the Polishing Wetlands in AUTOMATIC Mode, they will operate as LEAD/LAG/STANDBY.

6. Flow to the Polishing Wetlands is controlled in REMOTE-AUTO Mode based upon the station wetwell **LEVEL** (LIT-1115) or **FLOW** rate (FIT-1114), selectable in the OIS. While Flow control mode is selected, if the optional "Tertiary Feed Compensation" feature is enabled at the OIS, the Polishing Wetlands Pump Station flow (FIT-1418) will be added to the current flow mode setpoint thus compensating for the water diverted to the recycled water system. If a low level in the wetwell occurs, then all pumps shut down to protect the pumps. If a LOW-LOW or HIGH- HIGH chlorine residual condition received from PLC8 (R14-AIT-1403) pumps directed to the Polishing Wetlands will be stopped and locked out until reset in the OIS.

7. Flow to the Chlorine Contact Basin, when permitted by discharge mode selection is controlled, in REMOTE-AUTO Mode, based upon level in the Chlorine Contact Basin (LIT-1202) or flow rate (FIT-1105), selectable in the OIS.

E. LOCAL CONTROLS AND INSTRUMENTATION:

1. Flowmetering:

a. Instruments and Control Devices:

1) Chlorine Contact Basin influent flowmeter (FE/FIT-1105).

2) Polishing Wetlands influent flowmeter (FE/FIT-1114).

b. Local Control Station:

1) Control Devices: None.

2) Indicators and Alarms:

a) Local Flow Indicators (2) (FIT-1105/FIT-1114).

3) Hardwired Interlocks: None.

2. Wetwell Level Monitoring:

a. Instruments and Control Devices:

1) Pump Station wetwell LOW LOW level switch (LSLL-1106).
2) Pump Station sump wetwell transmitter (LIT-1115).
3) Chlorine Contact Basin level transmitter (LIT-1202).

b. Local Control Station:

1) Local level indicators (LIT-1106/LIT-1202).

c. Hardwired Interlocks: None.

3. Station Pumps (Each Pump):

a. Instruments and Protective Devices:

1) Pressure gauge – pump discharge (PI-1107).
2) Pressure switch pump discharge (PSH-1107).
3) Motor moisture detector switch (XS-1107).
4) Motor HIGH temperature switch (TSH-1107).

b. Local Control Station:

1) Control Devices:

a) START-LOCKOUT-STOP pushbuttons (HS-1107C).

2) Indicators and Alarms: None

3) Hardwired Interlocks: None.

4. Motorized Valves (Each Valve):

a. Instruments and Protective Devices:

1) Valve OPEN limit switch (ZSH-1109).
2) Valve CLOSED limit switch (ZSL-1109).

b. Valve Actuator:

1) Control Devices:

a) LOCAL-OFF-REMOTE switch (HS-1109A).
b) OPEN-STOP-CLOSE pushbuttons (HS-1109B).

2) Indicators and Alarms:

a) Valve OPEN indicator (ZLH-1109).
b) Valve CLOSED indicator (ZLL-1109)

c. Hardwired Interlocks: None.

F. MCC CONTROLS AND INSTRUMENTATION:

1. Flowmetering: No MCC Controls.

2. Wetwell Level Monitoring:

a. Instruments and Protective Devices: None

b. Control Devices:

1) The LOW LOW level switch, LSLL-1106, sends a signal to the MCC which stops all station pumps, after a time delay, adjustable in the MCC.

3. Station Pumps (Each Pump):

a. Instruments and Protective Devices: None.

b. VFD Control Devices:

1) LOCAL-OFF-REMOTE switch (HS-1107A).
2) START-STOP pushbuttons (HS-1107B).
3) Alarm RESET pushbutton (HS-1107C).
4) SPEED control (HIK/SIC-1107).

c. VFD Indicators and Alarms:

1) ON indicator (YL-1107).
2) Motor SPEED indicator (SIC-1107).
3) VFD FAIL alarm (YA-1107).
4) Motor HIGH temperature alarm (TAH-1107).
5) Motor moisture alarm (XA-1107).
6) HIGH discharge pressure alarm (PAH-1107).
7) LOW-LOW level alarm (LALL-1107C).

a. Hardwired Interlocks:

1) VFD FAIL, motor HIGH temperature (TSH-1107), motor moisture detected (XS-1107), pump discharge HIGH pressure (PSH-1107, or well LOW-LOW level (LSLL-1106) will shut down and lock out the affected pump and generate a corresponding alarm.

2) When a pump is locked out, it will not start until the alarm condition is cleared and the RESET pushbutton on the MCC is pressed.

3) In LOCAL Mode, the pumps are controlled by the START-STOP pushbuttons on the MCC or the START-LOCKOUT-STOP pushbuttons at the local control station.

4) In REMOTE Mode, the pumps are controlled by the PLC.

4. Motorized Valves: No MCC Controls.

G. PLC/OIS FUNCTIONS:

1. Flowmetering:

a. REMOTE-MANUAL: Not applicable.

b. REMOTE-AUTO:

1) Instrument signals from two flowmeters (FIT-1105 and FIT-1114) are wired to PLC5. These flow signals are available for use by flow paced chlorination controls and pump controls described elsewhere.

c. Screen Indicators and Alarms:

1) Flow indicator – flow to Chlorine Contact Basin (FI-1105).
2) Flow indicator – flow to Polishing Wetlands (FI-1114).

d. Inter-PLC Communications:

1) The Wetlands Pump Station flow signals FIT-1114, FIT-1105, and (FIT-1114+FIT-1105) are available from PLC5 to be read by PLC6 for use in flow pacing chlorination at the pump station.

2. Wetwell Level Monitoring:

a. REMOTE-MANUAL Mode: Not applicable.

b. REMOTE-AUTO Mode: Not applicable.

c. Screen Indicators and Alarms:

1) Station Wetwell Level indicator (LI-1115).

2) Station Wetwell HIGH Level alarm (LAH-1115).

3) Station Wetwell LOW Level alarm (LAL-1115).

4) Station Wetwell LOW-LOW Level alarm (LALL-1106).

d. Inter-PLC Communications: None.

3. Station Pumps (Each Pump):

a. REMOTE-MANUAL Mode:

1) START-STOP of pumps through OIS control graphic buttons.

2) MANUAL SPEED control.
3) Each pump operates independently in MANUAL Mode.

b. REMOTE-AUTO Mode:

1) The four station pumps are organized into two groups, one group pumping

to the Polishing Wetlands, the other group pumping to the Chlorine Contact Basin. The CALL ORDER for such pump groups is made manually by the operator. The GLOBAL CALL ORDER function is not implemented for these pumps.

2) The operator selects the destination for Pump 11-WEP-002 and/or Pump 11- WEP-003 using OIS control graphic buttons. Pumps 11-WEP-001, 002, 003, and 004 must all be OFF in order to change the dedicated destination for Pump 11-WEP-002 and/or Pump 11-WEP-003. SCADA will only accept destination selections that are logical; e.g., a pump may not be assigned to more than one group and discharge directions cannot conflict.

3) Whenever a change is made in a dedicated pumping destination, a popup screen appears on the OIS prompting the operator to verify correct position of the manual valve in the station discharge header.

4) When pump station motorized valves (11-VLV-001, 002), are both selected REMOTE, then when either valve is selected from AUTO to MANUAL or from MANUAL to AUTO, both valves or modes are changed. If both valves are selected REMOTE-AUTO, then if either valve is selected LOCAL, then the other valve will automatically be selected REMOTE-MANUAL.

5) If station motorized valves (11-VLV-001, 002) are selected REMOTE-AUTO when a change in the dedicated destination for Pumps 11-WEP-002, 003 is made, then the valves will automatically be opened or closed consistent with the designated pumping destination(s).

6) If the station motorized valves (11-VLV-001, 002) are selected LOCAL or REMOTE-MANUAL and any valve position is inconsistent with pump dedicated destinations and an affected pump is ON, then an alarm will result.

7) Pump Operation – pumping to the Polishing Wetlands:

   a) The pumps selected to pump to the Polishing Wetlands operate in either a FLOW CONTROL Mode or a LEVEL CONTROL Mode, as selected by the operator. Up to two pumps can pump to the Polishing Wetlands at the same time.

   b) In FLOW CONTROL Mode, the speed of the dedicated pump(s) is adjusted by the PLC to maintain a manually entered flow setpoint (0.0 to 12.0 mgd). The process variable signal is provided by FIT-1114.

   c) In FLOW CONTROL Mode, if TERTIARY FEED COMPENSATION is enabled at the OIS, the pumps will be flow paced to the sum of the fixed FLOW CONTROL setpoint from the OIS and dynamic flow from the Polishing Wetlands Pump Station flow meter (FIT-1418).

   d) In LEVEL CONTROL Mode, the speed of the dedicated pump(s) is adjusted by the PLC to maintain a manually entered station wetwell level setpoint. The process variable signal is provided by LIT-1115.

e) In either control mode, if a High-High or Low-Low chlorine residual is reported from the analyzer at the Polishing Wetlands Influent Box (R14- AIT-1403), pumps directed to the Polishing Wetlands will be stopped by the automatic controls. On Low-Low or HIGH-High a single signal is received from PLC8 using PLC to PLC communications.

8) Pump Operation – pumping to the Chlorine Contact Basin:

a) The pumps selected to pump to the Chlorine Contact Basin will only operate when the plant discharge mode is selected as CCB Discharge Mode. When the pland discharge mode is selected as Wetlands Discharge Mode, pumps directed to pump to the CCB will be locked out to prevent opertion in SCADA AUTO or MANUAL modes.

b) The pumps selected to pump to the Chlorine Contact Basin operate in a FLOW CONTROL Mode if RIVER DISCHARGE is ENABLED or a LEVEL CONTROL Mode if RIVER DISCHARGE is DISABLED. Up to three pumps can pump to the Chlorine Contact Basin.

c) In FLOW CONTROL Mode, the speed of the dedicated pump(s) is adjusted by the PLC to maintain a manually entered flow setpoint (0.0 to 16.0 mgd). The process variable signal is provided by FIT-1105.

d) In LEVEL CONTROL Mode, the speed of the dedicated pump(s) is adjusted by the PLC to maintain a manually entered Chlorine Contact Basin level setpoint. The range of the setpoint is 4.0 to 10.0 feet. The process variable signal is provided by LIT-1202.

9) In both FLOW CONTROL Mode and LEVEL CONTROL Mode, the PLC controls a set of pumps as follows:

a) When a LEAD pump is called to start, the pump is started at its minimum speed. The PLC will modulate the speed of the pump to achieve a flow or level setpoint using a software PID controller.

b) If the LEAD pump cannot achieve the setpoint at maximum speed after a duration, the PLC lowers the LEAD pump speed, calls the LAG pump, and modulates the speed of the LEAD and LAG pumps together.

c) If in FLOW Mode, if the pump speeds decrease to a minimum speed (due to a decrease in a PLC-generated speed command), after a duration the PLC stops the LAG pump and modulates the speed of the LEAD pump to maintain the setpoint. In LEVEL CONTROL Mode, pumps stop when level is below a minimum.

d) If three pumps are dedicated to destination, then the LAG2 pump

operates in conjunction with the LEAD and LAG1 pumps in a manner similar to that described above.

10) When operating in the LEVEL CONTROL Mode, if the LEAD pump's speed decreases to a minimum, then the LEAD pump will be stopped. Subsequent automatic restart of the LEAD pump will not occur until the level has increased to a deadband value above the level control setpoint. The deadband value is adjustable in the PLC.

11) Pump starting and minimum speeds are configurable in the PLC.

12) Should the River Discharge Outfall Gate (12-GAT-001) close when operating in River Discharge Enabled Mode, then any station pumps assigned to discharge to the Chlorine Contact Basin and operating in REMOTE AUTO FLOW CONTROL Mode. Reset to LEVEL CONTROL Mode.

13) If a LAG1 or LAG2 pump is called to run in REMOTE-AUTO Mode and a FAIL TO START alarm is received from that pump, the PLC control system will transfer that pump into SCADA MANUAL Mode. This is done to prevent the LEAD or LEAD and LAG1 pump from repeatedly reducing speed in attempts to start the malfunctioning LAG1 or LAG2 pump.

c. Screen Selectors, Indicators, and Alarms:

1) AUTO-MANUAL selector (CS-1107A).
2) START-STOP selector (CS-1107B).
3) ON indicator (YA-1107B).
4) RUN-time meter (KQI-1107).
5) LOCAL-REMOTE indicator (YA-1107A).
6) Motor speed indicator (SI-1107A).
7) VFD FAIL alarm (YA-1107).
8) Motor HIGH temperature alarm (TAH-1107).
9) Motor MOISTURE alarm (XA-1107).
10) Discharge HIGH pressure alarm (PAH-1107).
11) FAIL TO START alarm (YA-1107).

d. Inter-PLC Communications:

1) PLC6 provides Chlorine Contact Basin level information and River Discharge Outfall Gate (12-GAT-001) position to PLC5. Should PLC5 lose communication with PLC6, after 5 minutes all station pumps in REMOTE-AUTO Mode and dedicated to pump to the Chlorine Contact Basin are stopped. Pumps operating in LOCAL Mode will not be affected.

2) PLC8 provides chlorine residual (14-AIT-1403) Low-Low or HIGH-High signal to PLC5. Upon receipt, pumps directed to the Polishing Wetlands will shut down and be latched out until reset by the Operator. PLC8 also provides Polishing Wetlands Pump Station flow (FIT-1418) for use in flow

control compensation.

3) Any pump directed to the CCB is ON signal is presented for PLC6 for use in aborting river discharge if in Wetlands Discharge Mode.

4) Wetlands Discharge Mode Request is read from PLC6 for the purpose of locking out any Wetlands pumps directed to the CCB.

4. Motorized Valves:

a. REMOTE-MANUAL Mode:

1) OPEN-CLOSE of valves is through OIS control graphic buttons.

b. REMOTE-AUTO Mode:

1) PLC automatically opens and closes valves 11-VLV-001 and 002 to match configuration input for Wetlands Pumps when the pumps are in Remote Automatic Mode.

2) SCADA MANUAL mode selection for 11-VLV-001 and 002 will occur simultaneously if selected SCADA MANUAL or loss of REMOTE status of either valve is received.

c. Screen Indicators and Alarms:

1) OPEN-CLOSE indicator.
2) IN REMOTE indicator.
3) FAIL TO OPEN alarm.
4) FAIL TO CLOSE alarm.

d. Inter-PLC Communications: None.

3.03 WETLAND PUMP STATION CHEMICAL SYSTEM

The Control Strategies which follow cover chemical systems to be furnished and installed under this project. Refer also to Process and Instrumentation Diagrams.

A. REFERENCE:

1. Process Area: 11
2. P&ID's: 11I2, 11I3
5. PLC5
6. SCADA Screen: R11S2 and R11S3

B. MECHANICAL EQUIPMENT:

Tag Number	Equipment Name
11-T-001	Sodium Hypochlorite Tank No. 1

11-T-002	Sodium Hypochlorite Tank No. 2
11-T-003	Sodium Hypochlorite Tank No. 3
11-MOV-001	Tank 1 Motorized Valve No. 1
11-MOV-002	Tank 1 Motorized Valve No. 2
11-MOV-003	Tank 1 Motorized Valve No. 3
11-CMP-005	Sodium Hypochlorite Metering Pump No.1
11-CMP-006	Sodium Hypochlorite Metering Pump No.2
11-FIT-1140	Sodium Hypochlorite Flowmeter
11-EWS-001	Emergency Eyewash No.1
11-EWS-002	Emergency Eyewash No.2
11-HWH-001	Tepid Water Heater
11-SMP-001	Sample Pump 1
11-SMP-002	Sample Pump 2

C. INSTRUMENTATION EQUIPMENT:

Tag Number	Equipment Name
11-LIT-1135	Tank 1 Level Transmitter
11-LIT-1136	Tank 2 Level Transmitter
11-LIT-1137	Tank 3 Level Transmitter
11-LI-1135	Tank 1 Level Indicator
11-LI-1136	Tank 2 Level Indicator
11-LI-1137	Tank 3 Level Indicator
11-LSLL-1135	Tank 1 Low Level Float Switch
11-LSHH-1135	Tank 1 Hi hi Level Float Switch
11-LSLL-1136	Tank 2 Low Level Float Switch
11-LSHH-1136	Tank 2 Hi hi Level Float Switch
11-LSLL-1137	Tank 3 Low Level Float Switch
11-LSHH-1137	Tank 3 Hi hi Level Float Switch
11-AIT-1147	Total Cl2 Analyzer No.1
11-AIT-1148	Total Cl2 Analyzer No.2
11-LSH-1134	Containment Sump Hi hi level float

D. SYSTEM OVERVIEW:

1. The WEPS Chemical System consists of three 6,600 gal sodium hypochlorite tanks utilized for dosing chemical to the pump station discharge. Tanks can be selected as Lead Tank, Lag1 and Lag2 Tank.

2. Two metering pumps (located on individual skid) are dedicated to provide chemical dosing as follows:

    a. Pump 11-CMP-005 – Chemical Containment Area
    b. Pump 11-CMP-006 – Chemical Containment Area

3. These two metering pumps may be dedicated to dose based on the following control modes as follows:

    a. Flow paced or

b. Chlorine Residual paced.

This selection is made at the OIS.

4. In AUTO mode, a lead metering pump received a RUN signal from any of the four existing WEPS, it shall start and shall pace the flow signal from existing flowmeter FIT-1105 if flow pace mode is selected.

   In AUTO mode, a lead metering pump received a RUN signal from any of the four existing WEPS, it shall start and shall pace the Cl2 signal from Cl2 analyzer AIT-1147 or AIT-1148 if Chlorine pace mode is selected.

5. If the lead metering pump fails, the PLC shall automatically start the standby metering pump.

6. The tanks are manually filled by truck via a fill station at which there are level indicators which show the level in each tank, and will alert the attendant should the tank is overfilled and simultaneously generated local and remote alarms.

E. LOCAL CONTROLS AND INSTRUMENTATION:

1. Sodium Hypochlorite Flowmetering:

a. Instruments and Control Devices:

   1) Sodium Hypochlorite flowmeter (FE/FIT-1140).

b. Local Control Station:

   1) Control Devices: None.

   2) Indicators

   3) Hardwired Interlocks: None.

2. Sodium Hypochlorite Tank Level Monitoring:

a. Instruments and Control Devices:

   1) Tank 1 Level Transmitter (LIT-1135)
   2) Tank 2 Level Transmitter (LIT-1136)
   3) Tank 3 Level Transmitter (LIT-1137)

b. Local Control Station:

   1) Local level indicators (LI-1135, 1136, and1137).

c. Hardwired Interlocks: None.

3. Tank Motorized Valves (Each Valve):

a. Instruments and Protective Devices:

1) Valve OPEN limit switches (ZSH-1141, 1142 and 1143).
2) Valve CLOSED limit switch (ZSL-1141, 1142 and 1143).

b. Valve Actuator:

1) Control Devices:

a) LOCAL-OFF-REMOTE switches (HS-1141, 1142 and 1143).
b) OPEN-STOP-CLOSE pushbuttons (HS-1141B, 1142B and 1143B).

2) Indicators and Alarms:

a) Valve OPEN indicator (ZLH-1141, 1142 and 1143).
b) Valve CLOSED indicator (ZLL-1141, 1142 and 1143)

c. Hardwired Interlocks: None.

F. MCC CONTROLS AND INSTRUMENTATION:

1. Flowmetering: No MCC Controls.

2. Tank Level Monitoring:

a. Instruments and Protective Devices: None

b. Control Devices:

1) The LOW LOW level switches, LSLL-1135, 1136, or 1137, sends a signal to the PLC to switch to duty tank. If duty tank is not available, the metering pumps shall be shut down.

3. Sodium Hypochlorite Metering Pumps (Each Pump):

a. Instruments and Protective Devices: None.

b. VSD Control Devices:

1) LOCAL-OFF-REMOTE switch (HS-1138A, HS-1139A).
2) START-STOP pushbuttons (HS-1138B, 1139B).
3) Alarm RESET pushbutton (HS-1138C, 1139C).
4) SPEED control (HIK/SIC-1138, 1139).

c. VSD Indicators and Alarms:

1) ON indicator (YL-1138, 1139).
2) Motor SPEED indicator (SIC-1138, 1139).
3) VFD FAIL alarm (YA-1138, 1139).

4) Pump in REMOTE mode (HS-1138, 1139)
5) HIGH discharge pressure alarm (PAH-1138, 1139).

b. Hardwired Interlocks:

1) VSD FAIL, pump discharge HIGH pressure (PSH-1138, 1139) will shut down and lock out the affected pump and generate a corresponding alarm.
2) When a pump is locked out, it will not start until the alarm condition is cleared and the RESET pushbutton on the VSD is pressed.
3) In LOCAL Mode, the pumps are controlled by the START-STOP pushbuttons on the respective VSD.
4) In REMOTE Mode, the pumps are controlled by the PLC.

G. PLC/OIS FUNCTIONS:

1. Flowmetering:

a. REMOTE-MANUAL: Not applicable.

b. REMOTE-AUTO:

1) Instrument signals from two flowmeters (FIT-1105 and FIT-1114) are wired to PLC5. These flow signals are available for use by flow paced chlorination controls and pump controls described elsewhere.

c. Screen Indicators and Alarms:

1) Flow indicator – flow to Chlorine Contact Basin (FI-1105).
2) Flow indicator – flow to Polishing Wetlands (FI-1114).

d. Inter-PLC Communications:

1) The Wetlands Pump Station flow signals FIT-1114, FIT-1105, and (FIT-1114+FIT-1105) are available from PLC5 to be read by PLC6 for use in flow pacing chlorination at the pump station.

2. Flowmetering:

a. REMOTE-MANUAL: Not applicable.

b. REMOTE-AUTO:

1) Instrument signals from two flowmeters (FIT-1105 and FIT-1114) are wired to PLC5. These flow signals are available for use by flow paced controls for the metering pumps.

c. Screen Indicators and Alarms:

1) Flow indicator – flow to Chlorine Contact Basin (FI-1105).

3. Chlorine Residual:

a. REMOTE-MANUAL Mode: Not applicable

b. REMOTE-AUTO:

1) There are two Chlorine residual signals as redundant signals in case one analyzer fails or out of range or out of service. The metering pumps shall increase speed or reduce speed based on the residual value in the Chlorine Residual-paced mode.

4. Hypo Tank's MOVs:

a. MANUAL Mode:

1) OPEN-CLOSE of valves by local push buttons.

b. REMOTE-AUTO Mode/controls by PLC:

1) PLC automatically opens and closes valves 11-MOV-001, 002, 003 when respective tank is in service, and when a metering pump is running.

2) SCADA MANUAL mode selection for 11-VLV-001 and 002 will occur simultaneously if selected SCADA MANUAL or loss of REMOTE status of either valve is received.

c. Screen Indicators and Alarms for each MOV:

1) OPEN-CLOSE indicator.
2) IN REMOTE indicator.
3) FAIL TO OPEN alarm.
4) FAIL TO CLOSE alarm

5. EMERGENCY EYEWASHES

a. When activated, emergency eyewash (EWS-001, 002) shall trigger local audible and visual alarms, and simultaneously transfer the signal remotely to the PLC system for alarm and display in the SCADA system.

6. SAMPLE PUMPS

a. MANUAL mode:

1) START-STOP by local push buttons.

b. Screen indicator and alarm for each sample pump:

1) RUN indicator
2) FAIL alarm

7. Miscellaneous alarms and monitoring:

a. In case of accidental chemical spill and or piping breakage, the containment sump level rises and the float LSH-1134 shall trigger an alarm in the SCADA PLC system.

b. Heater HWH-001 provides required tepid water for the emergency eyewashes as required by OSHA. Its ON and FAIL status are monitored by the SCADA PLC system.

END OF SECTION

SECTION 13470
SCADA - PROGRAMMABLE LOGIC CONTROLLER SYSTEM

PART 1 – GENERAL

1.1 THE PROJECT

A. The project consists of improvements to chemical systems at the City of Petaluma's Water Reclamation Facility (WRF), including electrical, instrumentation and controls, and modifications to the Plant Supervisory Control and Data Acquisition (SCADA) system. The project touches in-service wastewater facilities, with constraints on interruptions to operations. Requirements for planning, execution, and documentation are extensive.

1.2 WORK INCLUDED

A. This Section sets forth requirements associated with control system modifications, including investigations, furnishing and installing equipment and systems, and coordination and sequencing of the work.

B. Plan, schedule, and execute the work, including submittals, to conform to overall project requirements, including those associated with process, civil, and mechanical work. This project modifies and expands instrumentation, hardwired controls, Plant Programmable logic controller (PLC) system, and Plant SCADA. The Contractor shall plan, schedule, coordinate, and manage the work of all trades and suppliers, plus include in planning and scheduling the work of the City's programmer.

C. The Contractor shall merge and incorporate requirement of other Specifications and work shown on the drawings into the work as specified herein.

1.3 DEFINITIONS:

A. Where a term is used in this section relating to instrumentation, and the meaning is not defined therein or elsewhere in the Contract Documents, the meaning of the term shall be as defined in ISA S51.1 Process Instrumentation Terminology, or if not contained in ISA 51.1, as defined in listed reference standards under "References".

B. CEET - Complete End-to-End Testing.

C. Control Circuit: Any logical circuit (operating usually at 120VAC or less or DC) whose principal purpose is the conveyance of control and interlock/protection information and not the conveyance of energy for the operation of an electrically powered device.

D. HMI: Human Machine Interface / OIS: Operator Interface Station.

E. Panel: An instrument support system which may be either a flat surface, a partial enclosure, or a complete enclosure for instruments and other devices used in process control systems. Unless otherwise specified or clearly indicated by the context, the term "panel" in these Contract Documents shall be interpreted as a general term, which includes flat panels, enclosures, cabinets and consoles.

F. PLC: Programmable Logic Controller.

G. Power Circuit: Any circuit operating at 120 VAC or more, whose principal purpose is the conveyance of power for motors, lighting and other power devices.

1.4 CONTROL SYSTEMS SUPERVISOR

A. The Contractor shall designate an individual as project Control Systems Supervisor (CSS). This individual shall have at least 10 years of experience leading field investigations, selection of instrumentation components and preparation of shop drawings, startup and commissioning of instrumentation and hardwired and programmed control systems for municipal water and/or wastewater treatment plants, and performing work of the character described in the following paragraphs.

B. Within 3 weeks of Notice to Proceed, the General Contractor shall provide a formal submittal declaring the identity of the Control Systems Supervisor, including evidence of his qualifications. The evidence shall show experience in leadership roles in all of the CSS areas of responsibility described in this Section. This individual, once qualifications are favorably reviewed, may not be replaced without written consent of the City.

C. The Control Systems Supervisor shall oversee all activities associated with planning, scheduling, documenting, and executing startup and testing of instrumentation and control systems, including testing and commissioning of modifications to the Plant SCADA system. The CSS shall become familiar with the Plant SCADA functional requirements, to understand the scope and implications of modifications.

D. The Control Systems Supervisor's responsibilities shall include, but not be limited to, the following:

1. Participate in development of overall project schedules and construction sequencing, with specific attention to instrumentation and controls.

2. Review and coordinate interconnection including control wiring, signal wiring, and interconnection among systems, devices, and sources of supply. This includes devices and systems installed under this project, as well as existing systems with which this project interfaces.

3. Develop and/or review each submittal and RFI relating to instrumentation and controls.

4. Coordinate with Arcsine Engineering who is the City's programmer.

5. Supervise field investigations associated with existing control panels, existing instruments, signal interfaces, and field decisionmaking regarding signal routing and points of interface. This project requires device-by-device, signal-by-signal, termination-by-termination reconnaissance in advance of shop drawing development for the following:

   a. Existing PLC Panel 11-PLC-05

      The Control Systems Supervisor shall lead the field efforts and manage deployment of that field information on to shop drawings which shall detail the signal-by-signal work.

6. Coordinate instrument and process control ranges and setpoints.

7. Coordinate, lead workshops specified herein.

8. While the Contractor is not responsible for the programming per se, the Contractor is responsible for understanding and accounting for the functional requirements in planning and executing startups and testing. Section 13425 includes existing and to-be-programmed functions, and the CSS shall familiarize themselves with the requirements, and in planning construction sequencing and cutovers/startups/testing, consider how to keep the Plant in service.

9. Review each applicable schedule, cutover plan, submittal, RFI, test procedure, test results, change, and other documents which include any instrumentation and/or controls.

10. Prior to submissions, review test plans and results.

11. Supervise startup and testing of existing and new instrumentation and control systems.

1.5 WETLAND PUMP STATION COORDINATION

A. The chemical systems to be installed under this project are associated with and coordinate with operation of the existing Wetlands Pump Stations (WEPS). Existing functions and new functions for the project's scope are presented in Section 13425.

B. Construction, cutovers, startup and testing, and commissioning of systems under this project shall anticipate and allow for operation of the WEPS throughout the construction process.

C. The Control System Supervisor shall familiarize themselves with WEPS's functionality, and incorporate that knowledge in the planning and execution of this project.

1.6 CONSTRUCTION SEQUENCING PLAN AND SCHEDULES

A. The Contractor shall develop and submit a detailed construction sequencing plan for the work, which integrates all aspects of the work. The plan shall include an overall project schedule, plus narrative describing activities and provisions necessary to meet the requirements specified herein. Sequences, precedents, and other requirements in these Specifications are basic requirements; and they are not intended to identify all aspects of construction sequencing. The Contractor shall anticipate and document all required activities.

B. Construction sequencing, continuous automatic control requirements, downtime requirements, testing, and other cutover requirements for this project are extensive. The Contractor shall carefully plan the work and allocate resources as required during cutovers to ensure that the work is performed as planned. The Engineer's review of the construction sequencing plan shall not be construed to be an endorsement of the Contractor's approach or agreement on resources required.

C. This Section describes an overall plan structure, with emphasis on electrical and controls. The Control System Supervisor shall lead development of the electrical and controls aspects of the Plan.

D. The Construction Sequencing Plan shall be lined up with and coordinated against the project schedules with special attention to submittals, testing, and other precedences and interrelationships. The Plan shall cover the following

1. Cover sheet.
2. Table of Contents.
3. Overview Narrative.
4. Schedule.
5. Dependencies:
    a. Listing of related work including, for example, providing temporary water sources and/or backing up the collection system.
6. Involved parties.
7. Sequence details:
    a. Narrative and/or steps describing the sequence(s). Estimated durations. Include all steps including checkout and testing.
8. Outages:
    a. Identification of the required outages.
9. City Involvement:
    a. Identify how/when City support is required, including operations, and related changes to the Plant Supervisory Control System performed by the City's programmer.
10. Risks:
    a. Listing of construction/execution risks (unexpected outcomes) and contingencies to respond to those unexpected outcomes.
11. Attachments:
    a. Provide drawings, sketches, any other documents needed to execute the work.
    b. Attach applicable Contract Drawings where needed to address details.

1.7 CONSTRUCTION STRATEGY

A. Prepare plans which meet the requirements herein and those covered elsewhere in the Contract Documents.

B. The Contractor shall develop the Construction Strategy, what is described below is a representative approach; with the final approach being determined by the Contractor, subject to project constraints.

C. Sequence:

1. Perform field investigations, develop and submit shop drawings, and satisfy all other prerequisites.

2. Construct new facilities.
3. For existing PLC enclosure (11-PLC-5) install new I/O modules. Install all interconnection to those points. The new input/output modules, plus existing spare I/O points, are adequate for the new systems and can coexist with existing. Meet the requirements in Section 01142-3.06 for temporary electrical, instrumentation, and control systems.
4. For cases where existing analog or discrete signals are needed for both old and new (and they are not landing on PLC I/O) install connectors, isolators, multiplying relays, or other provisions to allow for operation of both existing and new control systems simultaneously.
5. Fully check out new installations prior to scheduling or attempting integrated testing involving the Plant PLC/SCADA system. Checkouts include those specified in Division 13, Division 16, equipment specifications, and tests described in this Section. But at a minimum, tests should include the following:
6. Each instrument installed checked out, calibrated, ranged.
7. Chemical feed pumps and their motor control installed, checked out.
    a. All field interconnection wiring verified terminal-to-terminal, withPLC verification to occur later.
    b. All panel modifications are completed and tested.
8. Perform Operational Readiness Testing as described herein.
9. Develop test procedures, test forms, and checklists; and provide formal submittals for BEET and CEET. Include columns/entries for presence within the PLC and supervisory environment, and City submittal review comments will provide edits, if required. Conduct testing.
10. For Functional Acceptance Testing, the test procedures shall be developed by the Contractor's organization, with oversight by the Control Systems Supervisor. Include placeholders for testing of supervisory functions for which contributions will be made by the City's Programmer in the course of the submittal review process. The Control Systems Supervisor shall incorporate the edits and resubmit.
11. In the course of the above, include allowances to test new systems, and revert back to existing systems, as needed for testing and recoveries from failed conditions.
12. Once proven out, cease use of existing systems which are no longer required.
13. Perform training.
14. Develop and submit as built and other project documentation.

1.8 WORKSHOPS

A. The Contractor's organization shall conduct in-person workshops as specified herein, with City representatives, at City facilities. Workshops shall be 3 hours nominal each in duration.

B. Allow for five workshops minimum, over the course of the project.

C. Workshops shall be planned, and executed under the direction of the Control Systems Supervisor.

D. The Control Systems Supervisor shall prepare a detailed agenda for each workshop, and publish detailed minutes following each. Assemble required materials for each workshop.

E. These workshops shall not relieve the Contractor of the planning and submittal responsibilities associated with this project's work and systems.

F. The workshops are for the benefit of both the Contractor's organization and the City. If additional workshops are needed, schedule and execute them.

G. Workshops shall cover topics including the following, the content adjusted to meet project needs:

1. Existing, intermediate, and final process and controls arrangements.
2. Existing control functionality, ultimate control functionality, and migration details.
3. Data historization and Regulatory reporting, with particular attention to what is needed during startup and testing.
4. Signal interfaces, integrations among equipment and devices furnished and installed under this project.
5. Other topics as required.

H. Workshops are in addition to Construction and other meetings as called for in these Specifications.

I. Attendees shall include all applicable members of the Contractor's organization, but at a minimum include the Control Systems Supervisor, a knowledgeable representative of the General Contractor's organization, a knowledgeable representative of the Electrical Subcontractor's organization, and the parties responsible for the control system work. Where equipment and/or package systems are involved, knowledgeable representatives from those suppliers shall also attend.

J. Workshop recordkeeping by the Contractor shall be comprehensive.

1.9 SHUTDOWN REQUESTS

A. Each interruption in process, electrical, controls, or any aspect of Plant functionality, shall be preceded by a formal request to do so. Meet the requirements prescribed in Section 01142-1.05A2 for shutdown requests, submitted no fewer than 7 days in advance of the proposed shutdown.

1.10 SCHEDULING

A. The Contractor shall coordinate, schedule, and sequence/execute the work in accordance with requirements specified elsewhere, including the following:

1. 01100 – Summary of Work.
2. 01142 – Maintenance of Plant Operations

B. The Contractor's schedule shall allow for the following minimum milestones, events, and intervals associated with control systems including City-furnished programming:

1. Field investigations.
2. Submittals, reasonable expectations for resubmittals.
3. Workshops: as specified, placed at logical points in the process.
4. Program development, offsite testing by the City's Programmer: 4 months
5. Interval from proof of testing prerequisites, to commencement of testing, involving PLC/SCADA: 2 weeks
6. BEET/CEET: 3 days minimum
7. Allowance for Programmer corrections: 2 days
8. Allowance for Contractor corrections: as needed
9. Functional Acceptance Testing: Intervals as needed, but no shorter than the following:
    a. 1week for Strategy Field Testing as specified later in this Section
    b. 1 week for corrections and retesting
    c. 1 week for submission of test results
    d. 1 week for the 7-day operational test
    e. All an additional week for a second 7-day operational test, to allow for corrections required in the course of the first test, and restarting the 7-day clock

C. Last-minute changes in startup schedules are disruptive, and often result from lack of readiness. Schedules shall show completion milestones where prerequisites must be proven at least 2 weeks prior to scheduled commencement of startups/testing involving Plant PLC's/SCADA. If the milestone is not met, testing will be rescheduled. Reschedules will not necessarily be a day-for-day slip, but instead rescheduling far enough out to accommodate participants' availability and assure that the prerequisites will be met.

1.11 QUALITY ASSURANCE

A. References:

1. Work specified in this Section shall follow the applicable code and standards: EIA, ANSI, IEEE, ISA and NFPA.
2. Where provisions of the pertinent codes and regulations, requirements of the referenced standards, or these specifications conflict, the more stringent of the requirements shall govern.

1.12 SUBMITTALS

A. General:

1. Make all submittals and resubmittals in strict accordance with the provisions of Division 1, Section 01300 - Submittals, Section 01370 – Record Drawings, and Section 01142 – O&M Manual.

2. Make all submittals listed in Division 13, and any others required to fully describe what is to be furnished and/or installed under this Section.

B. Required Submittals:

1. Drawing index and detail part list.

2. System configuration diagram.

3. Wiring diagrams showing connection from each device and or relay or push button contact to the terminals of each I/O card.

4. Hardware list and cutsheets.

5. Bill of materials.

6. Test plan.

7. Other submittals as described herein.

PART 2 – PRODUCTS

2.1 MANUFACTURER AND SUPPLIER

A. The PLC components shall be manufactured by Modicon to match the City SCADA Standards for this specific location. No other manufacturers are acceptable. Modifications to existing Modicon PLC shall be as shown on the drawings and shall be described in this section. Contractor shall provide complete wiring from the field to the I/O cards' terminals as detailed on the drawings. The PLC and its auxiliaries shall be as shown on the Drawings and as specified in this section:

B. Provide and install the following hardware to the PLC as shown on the drawings and as described in this section:

1. One 8-point Analog Input card model no. 140 ACI 030 00

2. Two 16-point Digital Input card model no. 140 DAI 540 00

3. One 16-point Digital Output card model no. 140 DAI 542 10

4. Required terminal strips, fused terminals, cables, connectors, interposing relays, I/I converters etc.

C. Refer to Section 13471 – PLC I/O List for all required signals to and from PLC.

PART 3 – EXECUTION

3.1 PLC PANEL MODIFICATIONS:

A. The Contractor shall furnish, install and wire all devices and hardware required for this project. Hardware shall be field modified by an experienced integrator hired by the Contractor. The Contractor shall be required to provide all labor and materials to wire and connect all new signals to the existing PLC systems as specified and as shown on the drawings.

B. Existing PLC cabinet (11-PLC-5) shall remain functional during construction, and shall be modified with additional components such as I/O cards, control relays, signal splitters, terminals etc. See Section 1.9 for Shutdown Request requirements.

C. The Contract Drawings are based on information available at the time of design. Prior to making submittals, the Contractor shall perform detailed investigations of the existing panel and its interfaces, including point-by-point verifications of I/O and associated field wiring.

D. Prior to investigations, obtain existing drawings to the extent they are available, and mark those up as-built in the course of investigations. Submit in conjunction with shop drawings. The package shall clearly illustrate existing and new work.

E. Develop drawings depicting panel modifications as specified in Division 13, with special attention to input/output assignments.

F. The Contractor shall be responsible for all control systems work described in these specifications and drawings, including PLC hardware. The Contractor shall be responsible for all submittals, purchasing, assembly, packing, shipping, installation, set up, startup, specified testing, and as-built drawings for all control system equipment and purchased standard hardware.

G. Perform testing and training as described in this Section.

3.2 DEMOLITIONS AND REMOVALS

A. As described elsewhere herein, the intent is to commission new controls in parallel with existing controls. Existing devices, interconnection, control components, and programmed control functionality, shall be abandoned to the extent it is rendered unused at project completion. Later effort(s) will complete the removals.

B. Where demolitions are called for on the Contract Documents for this project, perform such demolition.

C. Where demolitions are needed to cutover to new systems, including cases where existing signals/circuits/instruments/controls require modifications in support of the new functions, then then the required modifications, demolitions, removal shall be performed under this Contract.

3.3 TESTING:

A. General:

1. Any testing or startup activity that requires the participation of the City shall be scheduled by the Contractor through written notification to the City. Contractor shall provide regularly updated testing and startup schedules to the City. In addition to any other form of notification, Contractor shall notify the City by email, or other mutually agreed upon means, five working days immediately prior to any testing or other activity requiring the participation of the City. This requirement is in addition to the intervals specified in Section 1.10. Failure to properly notify City shall result in rescheduling of test activity, solely at Contractor expense and without an extension to the project completion schedule.

B. Operational Readiness Tests (ORT):

1. General: Prior to startup and the Functional Acceptance Test, the entire system shall be certified (inspected, tested and documented) that it is ready for operation.

C. Basic End-to-End Testing (BEET):

1. For each and every analog and discrete circuit, perform Basic End-to-End Testing (BEET). This includes, but is not limited to, all local control panels, MCCs, VFDs, and hardwired circuits in control panels.

2. For each input, activate the signal at the primary field device, either by creating necessary process and equipment conditions or by disconnecting the wires at the field device and simulating the input signal. At the PLC, using the PLC programming software, verify proper receipt of the signal.

3. For each output signal from the PLC, activate the PLC output signal using the PLC programming software, and verify proper receipt of the signal at the controlled device in the field, either by observing equipment operation or by disconnecting the wires at the equipment and verifying proper receipt of the signal.

4. Verify proper signal receipt at all intermediate devices, such as indicators, signal trip and relay modules, etc.

5. The Loop/Component Inspections and Tests shall be implemented using City-approved forms and checklists.

6. Each loop shall have a Loop Status Report to organize and track its inspection, adjustment and calibration. These reports shall include the following information and check off items with spaces for sign off by the Control Systems Supervisor and other parties as applicable:

a. Project Name.

b. Loop Number.

c. Tag Number for each component.

d. Check offs/signoffs for each component.

e. Tag/identification.

f. Installation.

g. Termination - wiring.

h. Termination - tubing.

i. Calibration/adjustment.

j. Signoffs/signoffs for the loop.

k. Panel interface terminations.

l. I/O interface terminations.

m. I/O signal operation.

n. Inputs/outputs operational: received/sent, processed, adjusted.

o. Total loop operation.

p. Space for comments.

q. Each active Analog Subsystem element and each I/O module shall have a Component Calibration Sheet. These sheets shall have the following information, spaces for data entry and a space for sign off by the system supplier:

    i. Project Name.

    ii. Loop Number.

    iii. Component Tag Number of I/O Module Number.

    iv. Component Code Number Analog System.

    v. Manufacturer (for Analog system element).

    vi. Model Number/Serial Number (for Analog system).

    vii. Summary of Functional Requirements. For example:

        a). For Indicators and Recorders: Scale and chart ranges

        b). For Transmitters/Converters: Scale and chart ranges

        c). For I/O Modules: Input or output

r. Calibrations; for example:

    i. For Analog Devices: Required and actual inputs and outputs at 0, 25, 50, 75 and 100 percent of span, rising and falling.

    ii. For Discrete Devices: Required and actual trip points and reset points.

    iii. For I/O Modules: Required and actual inputs or outputs for 0, 10, 25, 50, 75 and 100 percent of span, rising and falling; 9 points calibration (5 points calibration will be rejected).

    iv. Space for comments.

    v. Space for sign off by the CSS.

    vi. The CSS shall maintain the Loop Status Reports and Components Calibration sheets at the job site and make them available to the Construction Manager/City at any time.

s. These inspections and tests do not require witnessing. However, the Construction Manager will have the option to review Loop Status Sheets and Component Calibration Sheets and spot-check their entries periodically and upon completion of the Operational Readiness Tests. Any deficiencies found shall be corrected.

D. Complete End-to-End Acceptance Tests (CEET):

1. For the PLC, CEET testing shall not commence until all Loop Acceptance Tests for the PLC have been satisfactorily completed, and all test results (including all forms signed off) have been submitted for review and accepted. For each and every analog and discrete circuit, perform an end-to-end test between the field device and the HMI computer operator station, and including all intermediate readouts

2. In general, the end-to-end testing is a two or more person test. The Contractor shall provide personnel to operate equipment or simulate signals that are to be verified as part of this test.

3. Check each loop from the field element to the respective computer control display. Include all intermediate field instruments, control devices, panels, indicators and other devices in the loop to ensure proper operation and linkage to computer control station displays.

4. Analog signals shall be tested at 0, 50, and 100 percent of scale to verify the proper receipt on computer control displays.

5. Discrete input circuits shall be tested to verify proper state when the field device is switched between states. Discrete output circuits shall be tested to verify equipment responds properly (start, stop, etc.).

6. Contractor shall provide adequate time in the Construction Schedule for CEET testing.

E. Functional Acceptance Test (FAT)

1. Prior to startup and the Functional Acceptance Test (FAT), the entire installed instrument and control system shall be certified that it is ready for operation. All preliminary testing, inspection, and calibration shall be complete as defined in the Operational Readiness Tests.

2. Once the facility has been started up and is operating, a witnessed FAT shall be performed on the complete system to demonstrate that it is operating and in compliance with these Specifications. Each specified function shall be demonstrated on a paragraph-by-paragraph, loop-by-loop, and site-by-site basis.

3. Strategy Field Testing (SFT):

a. This test is a joint test involving the Contractor’s organization, and the City’s programmer. The City’s Programmer, and City staff as applicable, will operate and view system statuses from the Plant Control System. The Contractor will structure and lead the overall test, and will perform all work in the hardwired environment. The Control Systems Supervisor shall be present onsite for the duration of the SFT

b. The Contractor shall include in the Construction Schedule the durations as specified in Section 1.10, minimum.

c. For each control strategy and for each electrical schematic diagram, demonstrate the proper operation of all hardware and software logic and control functions. The Contractor-developed test procedures specified earlier shall include detailed descriptions of the tests. Perform a step by step test of each function described in each control strategy.

d. Perform separate tests on each individual piece of equipment

e. Perform the proper operation of each discrete control loop to ensure the proper operation of motors, hand switches, interlocks, solenoid valves, other auxiliary devices, status lights, computer control operator interfaces, and alarms.

f. 7-day Operational Test

g. Following successful completion of strategy field testing, and submission of test results, commence an operational test.

h. The system shall operate automatically continuously for 7 days without failure before this test will be considered successful. In the event of a failure, make corrections, and restart the test.

3.4 TRAINING

A. Provide two 4-hour training sessions for 3 plant personnel at the site. The training shall include classroom and hands-on practice of the system furnished.

END OF SECTION

SECTION 13471
PLC INPUT/OUTPUT LISTING

The following I/O List includes all physical signals available from field equipment/devices such as flowmeters, valve actuators, Chlorine probes/controllers specified in Div 13.

City of Petaluma
ECWRF- Chemical System Upgrade Phase 1 Project
PLC INPUT/OUTPUT LIST

Project No. 482
Date: 01-26-2024

ITEM No.	EQUIPTMENT DESCRIPTION	EQUIPT. TAG	SIGNAL LOOP	SIGNAL FUNCTION	TYPE	DWG No.	Notes
1	Sodium Hypo Tank 1	11-LIT-1135	11-LI-1135	Level Indication	AI	I-2	Wired to Rack 1 Slot 4 card - Point 5
2	Sodium Hypo Tank 2	11-LIT-1136	11-LI-1136	Level Indication	AI	I-2	Wired to Rack 1 Slot 4 card - Point 6
3	Sodium Hypo Tank 3	11-LIT-1137	11-LI-1137	Level Indication	AI	I-2	Wired to Rack 1 Slot 5 card - Point 5
4	Tank 1 Discharge Valve	11-MOV-001	11-HS-1141	Remote Mode	DI	I-2	Wired to Rack 1 Slot 12 card - Point 1
5	Tank 1 Discharge Valve	11-MOV-001	11-ZL-1141	Valve Closed	DI	I-2	Wired to Rack 1 Slot 12 card - Point 2
6	Tank 1 Discharge Valve	11-MOV-001	11-ZH-1141	Valve Open	DI	I-2	Wired to Rack 1 Slot 12 card - Point 3
7	Tank 1 Discharge Valve	11-MOV-001	11-ZA-1141	Valve Fail	DI	I-2	Wired to Rack 1 Slot 12 card - Point 4
8	Tank 1 Discharge Valve	11-MOV-001	11-HS-1141A	Valve Open Command	DO	I-2	Wired to Rack 1 Slot 14 card - Point 10
9	Tank 1 Discharge Valve	11-MOV-001	11-HS-1141B	Valve Close Command	DO	I-2	Wired to Rack 1 Slot 14 card - Point 11
10	Tank 2 Discharge Valve	11-MOV-002	11-HS-1142	Remote Mode	DI	I-2	Wired to Rack 1 Slot 12 card - Point 5
11	Tank 2 Discharge Valve	11-MOV-002	11-ZL-1142	Valve Closed	DI	I-2	Wired to Rack 1 Slot 12 card - Point 6
12	Tank 2 Discharge Valve	11-MOV-002	11-ZH-1142	Valve Open	DI	I-2	Wired to Rack 1 Slot 12 card - Point 7
13	Tank 2 Discharge Valve	11-MOV-002	11-ZA-1142	Valve Fail	DI	I-2	Wired to Rack 1 Slot 12 card - Point 8
14	Tank 2 Discharge Valve	11-MOV-002	11-HS-1142A	Valve Open Command	DO	I-2	Wired to Rack 1 Slot 14 card - Point 12
15	Tank 2 Discharge Valve	11-MOV-002	11-HS-1142B	Valve Close Command	DO	I-2	Wired to Rack 1 Slot 14 card - Point 13
16	Tank 3 Discharge Valve	11-MOV-003	11-HS-1143	Remote Mode	DI	I-2	Wired to Rack 1 Slot 12 card - Point 9
17	Tank 3 Discharge Valve	11-MOV-003	11-ZL-1143	Valve Closed	DI	I-2	Wired to Rack 1 Slot 12 card - Point 10
18	Tank 3 Discharge Valve	11-MOV-003	11-ZH-1143	Valve Open	DI	I-2	Wired to Rack 1 Slot 12 card - Point 11
19	Tank 3 Discharge Valve	11-MOV-003	11-ZA-1143	Valve Fail	DI	I-2	Wired to Rack 1 Slot 12 card - Point 12
20	Tank 3 Discharge Valve	11-MOV-003	11-HS-1143A	Valve Open Command	DO	I-2	Wired to Rack 1 Slot 14 card - Point 14
21	Tank 3 Discharge Valve	11-MOV-003	11-HS-1143B	Valve Close Command	DO	I-2	Wired to Rack 1 Slot 14 card - Point 15
22	Metering Pump 1	11-WEP-005	11-HS-1138	Remote Mode	DI	I-2	Wired to Rack 1 Slot 13 card - Point 1
23	Metering Pump 1	11-WEP-005	11-YL-1138	Pump Run	DI	I-2	Wired to Rack 1 Slot 13 card - Point 2
24	Metering Pump 1	11-WEP-005	11-YA-1138	Pump Fail	DI	I-2	Wired to Rack 1 Slot 13 card - Point 3
25	Metering Pump 1	11-WEP-005	11-PAH-1138	Pump Hi Pressure	DI	I-2	Wired to Rack 1 Slot 13 card - Point 4
26	Metering Pump 1	11-WEP-005	11-HS-1138A	Pump Run Command	DO	I-2	Wired to Rack 1 Slot 15 card - Point 1
27	Metering Pump 1	11-WEP-005	11-SI-1138	Pump Speed Indication	AI	I-2	Wired to Rack 1 Slot 5 card - Point 6
28	Metering Pump 1	11-WEP-005	11-SIC-1138	Pump Speed Command	AO	I-2	Wired to Rack 1 Slot 6 card - Point 5

ITEM No.	EQUIPTMENT DESCRIPTION	EQUIPT. TAG	SIGNAL LOOP	SIGNAL FUNCTION	TYPE	DWG No.	Notes
29	Metering Pump 2	11-WEP-006	11-HS-1139	Remote Mode	DI	I-2	Wired to Rack 1 Slot 13 card - Point 5
30	Metering Pump 2	11-WEP-006	11-YL-1139	Pump Run	DI	I-2	Wired to Rack 1 Slot 13 card - Point 6
31	Metering Pump 2	11-WEP-006	11-YA-1139	Pump Fail	DI	I-2	Wired to Rack 1 Slot 13 card - Point 7
32	Metering Pump 2	11-WEP-006	11-PAH-1139	Pump Hi Pressure	DI	I-2	Wired to Rack 1 Slot 13 card - Point 8
33	Metering Pump 2	11-WEP-006	11-HS-1139A	Pump Run Command	DO	I-2	Wired to Rack 1 Slot 15 card - Point 2
34	Metering Pump 2	11-WEP-006	11-SI-1139	Pump Speed Indication	AI	I-2	Wired to Rack 1 Slot 7 card - Point 1
35	Metering Pump 2	11-WEP-006	11-SIC-1139	Pump Speed Command	AO	I-2	Wired to Rack 1 Slot 6 card - Point 6
36	Eye Wash Station 1 - Flow SW	11-FSH-1144	11-FAH-1144	Station Activated	DI	I-2	Wired to Rack 1 Slot 13 card - Point 9
37	Eye Wash Station 2 - Flow SW	11-FSH-1146	11-FAH-1146	Station Activated	DI	I-2	Wired to Rack 1 Slot 13 card - Point 10
38	Chemical Sump - Float Switch	11-LSH-1134	11-LAH-1134	Sump Hi Level Alarm	DI	I-2	Wired to Rack 1 Slot 13 card - Point 11
39	Fill Station Control Panel	11-LCP-003	11-LAH-1134	Tank Overfilled Alarm	DI	I-2	Wired to Rack 1 Slot 13 card - Point 12
40	Fill Station Control Panel	11-LCP-003	11-LSH-1134	Overfill Backup Alarm	DO	I-2	Wired to Rack 1 Slot 15 card - Point 3
41	CL2 Residual Alanyzer 1	11-AE/AIT-1147	11-AI-1147	Cl2 Indication	AI	I-2	Wired to Rack 1 Slot 7 card - Point 2
42	CL2 Residual Alanyzer 2	11-AE/AIT-1148	11-AI-1148	Cl2 Indication Redundant	AI	I-2	Wired to Rack 1 Slot 7 card - Point 3
43	Sodium Hypo Magmeter	11-FE/FIT-1140	11-FI-1140	Chemical Flow Indication	AI	I-2	Wired to Rack 1 Slot 7 card - Point 4
44	Tepid Water Heater	11-HWH-001	11-YL-1145	Heater On	DI	I-2	Wired to Rack 1 Slot 13 card - Point 13
45	Tepid Water Heater	11-HWH-001	11-YA-1145	Heater Malfunction	DI	I-2	Wired to Rack 1 Slot 13 card - Point 14
46	Sample Pump 1	11-SMP-001	11-YL-1147	Run	DI	I-3	Wired to Rack 1 Slot 12 card - Point 13
47	Sample Pump 1	11-SMP-001	11-YA-1147	Fail/Overload	DI	I-3	Wired to Rack 1 Slot 12 card - Point 14
48	Sample Pump 2	11-SMP-002	11-YL-1148	Run	DI	I-3	Wired to Rack 1 Slot 12 card - Point 15
49	Sample Pump 2	11-SMP-002	11-YA-1148	Fail/Overload	DI	I-3	Wired to Rack 1 Slot 12 card - Point 16

ITEM No.	EQUIPTMENT DESCRIPTION	EQUIPT. TAG	SIGNAL LOOP	SIGNAL FUNCTION	TYPE	DWG No.	Notes

DI : Discrete Input
DO : Discrete Output
AI : Analog Input
AO : Analog Output
(1) Subscript for functions shall be as per ISA standards

SECTION 15051

GENERAL PIPING REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. General piping requirements that apply to all piping.

1.02 RELATED REQUIREMENTS

A. Section 01300, Submittal Procedures

B. Section 01730, Record Drawings

C. Section 02050, Demolition

D. Section 02223, Trenching, Backfilling and Compaction

E. Section 09900, Painting and Coating

F. Section 10401, Signage

G. Section 15052, Pressure Testing of Piping

H. Section 15054, Disinfection of Piping

I. Section 15061, Ductile Iron Pipe

J. Section 15065, PVC Gravity Sewer Pipe

K. Section 15066, Small-Diameter PVC Pressure Pipe

1.03 REFERENCES

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

AWWA C105	Polyethylene Encasement for Ductile-Iron Pipe Systems
AWWA C111	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C116	Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings
AWWA C200	Steel Water Pipe – 6 In. (150 mm) and Larger
AWWA C203	Coal-Tar Protective Coatings and Linings for Steel Water Pipe
AWWA C210	Liquid-Epoxy Coatings and Linings for Steel Water Pipe and Fittings
AWWA C213	Fusion-Bonded Epoxy Coatings and Linings for Steel Water Pipe and Fittings
AWWA C606	Grooved and Shouldered Joints
AWWA C900	Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. – 60 in. (100 mm – 1,500 mm)

AWWA M11	Steel Pipe - A Guide for Design and Installation
AWWA	Guidelines for Distribution of Non-potable Water
ANSI A13.1	Scheme for the Identification of Piping Systems
ASTM A123	Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products
ASTM A193	Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and other Special Purpose Applications
ASTM A194	Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
ASTM A307	Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rods
ASTM A563	Standard Specification for Carbon and Alloy Steel Nuts

1.04 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. CPVC: Chlorinated polyvinyl chloride plastic.

1.05 SUBMITTALS

A. All submittals shall be submitted in accordance with Section 01300, “Submittal Procedures.”

B. Pipe Data:

1. Items specifically called for in the detailed pipe Sections.
2. Any proposed major relocation of piping from what is shown on the Drawings.
3. Any proposed change of materials, jointing methods, or supports from what is shown on the Drawings or what is specified these Technical Specifications.
4. Manufacturer’s data sheets on pipe, joints, and fittings including dimensions, wall thickness, weight, coating and lining.
5. Manufacturer’s catalog data and descriptive literature for the following:

a. Polyethylene encasement

b. Pipe sleeves

c. Modular annular sealing devices

d. Bolts and nuts

e. Warning tape, tracer wire

f. Transition fittings

g. Dielectric fittings

h. Escutcheons

6. Concrete mix design for thrust blocks

7. Descriptive information regarding proposed thrust restraint methods and materials, including sizing calculations for thrust blocks or restrained lengths of pipe adjacent to bends and fittings.

8. List of piping identification labels and color schemes.

C. Welding certificates.

1.06 PIPE SCHEDULE

A. Refer to the Drawings for the Pipe Schedule.

1.07 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."

2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.09 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Lining contamination prevention.

1. The State of California Department of Public Health is responsible for regulated public water systems that provide drinking water in California and for establishing drinking water standards for contaminants that threaten the water supply.
2. Volatile organic compounds present in the linings of items in contact with potable water or recycled water shall not exceed concentrations allowed by the latest regulations.
3. Some products and materials may also require proof of National Sanitation Foundation (NSF) certification on the lining materials to be used.

2.02 POLYETHYLENE ENCASEMENT

A. Polyethylene encasement shall be as indicated below:

1. Polyethylene film shall be linear low-density material in accordance with AWWA C105.
2. Polyethylene wrap and sleeves shall be a minimum 8 mil thick.
3. Polyethylene materials shall be kept out of exposure to direct sunlight.
4. Polyethylene wrap and sleeves shall be “clear” for use with potable water and “purple” for use with recycled water.
5. Polyethylene encasement shall be secured with 2-inch wide polyethylene or vinyl adhesive tape or with plastic tie straps.

2.03 PIPE SLEEVES

A. In slab and wall construction sleeves 6-inch diameter and smaller shall be Schedule 40 carbon steel pipe. Sleeves 8-inch in diameter and larger shall be ¼-inch carbon steel pipe.

1. The sleeves shall be hot-dip galvanized after fabrication.

2.04 PIPE FLOOR COVERS

1. For all piping installed on the floor slab, contractor shall install pipe covers to prevent trip hazard and to prevent damage to piping and shall align with the following minimum requirements.

a. Adequate sizing to appropriately cover the full pipe diameter and length of pipe within the walkway

b. Safety yellow with black edging

c. Coarse non-slip surface

d. Fiberglass reinforced plastic

e. Corrosion and flame resistant

f. Adequate to withstand 1,000 pounds of vertical load

2.05 MODULAR ANNULAR SEALING DEVICE

A. Manufacturer:

1. Provide the following mechanical seal system:

a. "Link-Seal Modular Seal" assembly as manufactured by PSI/Thunderline/Link-Seal or Approved Equal.

B. General:

1. All pipes installed through cast or core drilled penetrations or sleeves shown on the Drawings shall be installed with a modular annular sealing device, unless otherwise noted.

2. Wall openings sizes and types provided by the Contractor shall be selected according to the proposed mechanical seal manufacturer's recommendations.

3. Sufficient quantities of the modular annular sealing device shall be supplied to effectively provide a hydrostatic seal.

4. Each seal shall be conspicuously and permanently identified with the name of the manufacturer and the model number.

C. Design:

1. All mechanical seals shall be modular type consisting of inter-locking synthetic rubber links shaped to continuously fill the annular space between the pipe and the wall opening.

2. The elastomeric element shall be sized and selected per the manufacturer's recommendations and have properties as designated by ASTM.

3. Provide Nitrile elastomer. Provide green coloration throughout elastomer for positive field inspection.

4. Mechanical seal pressure plates shall be molded of glass reinforced nylon.

5. Mechanical seal hardware shall be sized according to the manufacturer's technical data. Provide 316 stainless steel hardware.

2.06 BOLTS AND NUTS

A. General:

1. All bolts and nuts shall be new and unused.

2. All bolt heads and nuts shall be hexagonal.

3. Provide washers of the same material as the nuts for each nut.

4. Bolts shall not be reused once tightened. Used bolts and nuts shall be discarded.

5. Bolts and nuts shall be cleaned, if needed, by wire brushing and shall be lubricated prior to assembly.

6. Buried bolts and nuts shall receive a heavy coat of protective grease prior to being wrapped with polyethylene, Sanchem NO-OX-ID or approved equal.

7. All stainless-steel bolts shall be coated with an anti-seize compound, Locktite or approved equal.

B. Bolts and nuts for the installation of pipelines located indoors, outdoors above ground, in vaults and structures, or where buried and wrapped with polyethylene material shall be zinc-plated or fluoropolymer coated carbon steel conforming to ASTM A307, Grade A for bolts, and ASTM A563, Grade A for nuts.

C. Bolts and nuts for the installation of pipelines exposed to water or in direct contact with earth shall be 316 stainless steel conforming to ASTM A193, Grade B8M for bolts, and ASTM A194 Grade 8M for nuts.

D. Bolts used in flange insulation kids shall conform to ASTM A193, Grade B7. Nuts shall conform to ASTM A194, Grade 2H.

2.07 WARNING TAPE, TRACER WIRE

A. Warning tape:

1. The tape shall be an inert, non-metallic plastic film formulated for prolonged underground use.

2. The tape shall be minimum 4 mil thick and 6 inches wide, with the message printed continuously on one side.

3. The ink used to print messages shall be permanently fixed to the tape and shall be black.

4. Tape shall be colored as follows to identify the type of utility:

   a. Potable Water: Blue

   b. Recycled Water: Purple

   c. Sanitary Sewer: Green

   d. Electric: Red

B. Tracer wire:

1. Tracer wire shall be #14 AWG solid copper UF type wire with cross linked polyethylene insulation.

2. Wire splices shall be accomplished using a direct bury silicone-filled wire nut connectors.

2.08 CONCRETE FOR THRUST BLOCKS

A. Minimum 28-day compressive strength of 3,000 psi. Type V Portland cement shall be used.

2.09 COUPLINGS, PUSH-ON JOINT RESTRAINTS, AND EXPANSION JOINTS

A. Refer to Section 15165, “Mechanical Pipe Couplings” for requirements.

2.10 PIPE HANGERS AND SUPPORTS

A. Refer to Section 15090, “Pipe Hangers and Supports” for requirements.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. Where piping passes through the walls of tanks or channels below the water surface or where detailed on the Drawings to have a wall pipe, the wall pipe shall be cast directly into the concrete.

B. Where piping passes through the walls of tanks or channels above the water surface or though dry walls, a sleeve or block out may be used unless specifically noted otherwise on the Drawings.

C. If the pipe material is not called out on the Drawings or specified otherwise, the Contractor shall notify the Agency. The Contractor shall not order or install any piping that does not have a specific material called out until the Agency has confirmed the material to be used for that service.

D. Suitable caps or blind flanges shall be furnished on all pipes or branches that are to be left unconnected.

3.02 TEMPORARY PIPELINES

A. All temporary piping, fittings, and service connections shall be furnished, installed, and maintained by the Contractor. The Contractor shall make the connection to a water source designated by the Agency.

1. All pipe, valves, fittings, hose and connections furnished by the Contractor shall be of good quality, clean, and suitable for conveying potable water in the opinion of the Agency.
2. The temporary pipe shall be installed in such a manner that it will not present a hazard to traffic and will not interfere with access to homes and driveways along its route.
3. Valves shall be installed at 200-foot intervals or as directed by the Agency. The use of pressure reducing valves may be required as directed by the Agency.
4. The Contractor shall be responsible for disinfecting all pipe, connections, flushing, and assisting the Agency in taking water samples for bacteriological testing. Refer to Section 15054, “Disinfection of Piping.”
5. Following disinfection and acceptance of the temporary pipe as a potable water system, the Contractor shall maintain continuous service through the temporary piping to all consumers normally served both directly and indirectly by the pipeline.
6. Upon completion of the work, the Contractor shall remove the temporary piping and appurtenances and shall restore all surfaces to the satisfaction of the Agency.

B. If repairs to temporary piping are necessary, the Contractor shall make such repairs in a timely manner as directed by the Agency.

1. If progress in making repairs is inadequate, or in the event of emergency, the Agency may take immediate corrective measures, which may include the performance of repair work by Agency forces or another contractor.
2. All costs for corrective measures shall be borne by the Contractor.

3.03 HANDLING

A. Pipe, fittings, valves, and accessories shall be handled in a manner that will insure their installation in sound, undamaged condition.

1. Equipment, tools and methods used in unloading, storing, reloading, hauling, and laying pipe and fittings shall be such that they are not damaged.

2. Hooks inserted in ends of pipe shall have broad, well-padded contact surfaces.

B. Pipe and fittings in which the lining or coating has been broken or loosened shall be replaced by the Contractor at his expense.

1. Where the damaged areas are small and readily accessible, the Contractor may be permitted to repair the lining or coating, subject to the review by the Agency.

2. Repair of lining or coating which has been damaged shall be repaired by the Contractor before installing the pipe.

3.04 CLEANING

A. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being installed. No debris, tools, clothing, or other materials shall be placed in the pipe.

1. The interior of all pipe and fittings shall be thoroughly cleaned of all foreign matter before being installed and shall be kept clean until the work has been accepted.

2. All lumps, blisters, and excess coating shall be removed from exterior spigot and interior bell surfaces. Such surfaces shall be wire brushed and wiped clean and dry and free from oil and grease before placing the spigot in the bell.

3. Prior to installation of piping, valves and fittings in structures, all concrete surface preparation shall be completed and the work area shall be maintained in a broom clean condition during the pipe installation.

3.05 CUTTING

A. Cutting shall be done in a neat manner without damage to the pipe or lining.

1. Pipe cuts shall be smooth, straight, and at right angles to the pipe axis.

2. All cutting of pipe shall be done with mechanical pipe cutters designed for the specific work required. All cut ends shall be, if applicable, reamed to full bore before assembling.

3.06 THRUST RESTRAINT

The Contractor shall furnish and install thrust restraint on piping systems subject to pumped or pressurized flow, or otherwise indicated on the Drawings or Specifications as requiring thrust restraint.

1. The Contractor shall assume sole responsibility for sizing and providing adequate thrust restraint for all pipelines.

2. The thrust restraint method used shall be designed to withstand the maximum internal line pressures created during testing of the particular line.

3. All above ground pipe joints shall be restrained.

4. All buried pipe joints at changes in pipe diameter or direction (line or grade), valves, fittings or other pipeline components shall be restrained.

5. Refer to pipe material Sections for joint types that may be used with a particular pipe material.

6. Thrust restraint at any particular joint requiring restraint shall be provided either by concrete thrust block or mechanical joint restraints, as shown on the Drawings or as directed by the Agency. Thrust restraint by a combination of mechanical joint restraints and thrust block shall not be used at a particular joint.

   a. Where thrust blocks are used for joint restraint, they shall conform to the sizing requirements of the Agency or as shown on the Drawings.

   b. Refer to individual piping sections for restrained joints requirements.

3.07 POLYETHYLENE ENCASEMENT

A. Polyethylene encasement shall completely encase and cover all metal surfaces.

1. Install polyethylene encasement prior to placing concrete anchors, collars, supports or thrust blocks.

2. All ductile-iron pipe and pipe-shaped appurtenances such as bends, reducers and offsets shall be encased with polyethylene sleeves in accordance with Method A described in AWWA C105, or with polyethylene wrap in accordance with Method C described in AWWA C105.

3. Odd-shaped appurtenances such as tees and crosses shall be encased with polyethylene wrap in accordance with AWWA C105.

4. Valves shall be encased with polyethylene wrap in accordance with AWWA C105 such that only the stem and operating nut are exposed and the wrap shall be attached so that valve operation will not disturb the wrapping or break the seal.

5. Polyethylene wrap shall be secured with polyethylene or vinyl adhesive tape or plastic tie straps in a manner that will hold the wrap securely in place during backfill.

6. Polyethylene sleeves shall be secured with polyethylene or vinyl adhesive tape or plastic tie straps at the ends and quarter points along the sleeve in a manner that will hold the sleeve securely in place during backfill.

3.08 PIPE REQUIREMENTS AT EXPANSION JOINTS CROSSINGS

A. The Contractor shall furnish and install expansion fittings on all pipelines as required to accommodate structural expansion considerations.

B. Refer to Section 15165, “Mechanical Pipe Couplings” for slip type joints that allow for thermal expansion or contraction in steel or cast iron pipelines.

3.09 PIPE SLEEVES

A. Positioning and Placement:

1. Sleeves shall be set in forms before concrete is poured.

2. In slab construction the sleeve shall extend ½ inch above floor.

3. Sleeves shall be positioned and held in place with temporary, external supports.

4. Fastening the sleeves to the structural reinforcing or any other intended or incidental contact of the sleeve with the rebar or other embedments shall not be allowed.

B. Coating:

1. All metallic pipes, wall and slab sleeves, and conduits encased in cast-in-place concrete structures shall be coated with an acceptable dielectric coating to prevent pipe contact with the concrete and/or reinforcing steel.

2. The dielectric coating shall be epoxy material conforming to AWWA C210 or AWWA C116. Surface preparation, multi-coat application, and total dry film thickness shall conform to AWWA standard minimums and manufacturer's recommendations, whichever is greater.

3. Embedments shall be inspected prior to concrete placement and any damage to the coating system shall be repaired in accordance with the manufacturer's written recommendations.

3.10 PIPE FLOOR COVERS

A. Positioning and Placement:

1. Pipe covers shall be adequately sized and shall be placed over the top of any piping installed along the floor.

2. Pipe covers shall be installed in alignment with manufacturer recommendations/requirements to prevent any horizontal or vertical movement.

3.11 MODULAR ANNULAR SEALING DEVICES

A. Install according to the Manufacturer's written instructions and recommendations.

3.12 HOLES IN STRUCTURAL ELEMENTS

A. No holes for pipe or equipment will be allowed in any structural members (except where noted on the Drawings) without consent of the Agency.

1. Sleeve for holes through new concrete construction shall be placed in forms before pouring of concrete.

2. Should any additional holes be required through structural members, or where notching, boring or cutting of the structure is necessary, the work shall be done as directed by the Agency.

a. The Contractor shall, at a time in advance of the work, furnish information and/or drawings pertaining to his requirements for these openings.

b. Should the furnishing of this information be neglected, delayed, or incorrect, and additional cutting found to be required, it shall be performed by the Contractor at no additional cost to the Agency.

3. Any piping that has to pierce waterproof construction shall be done with care. The opening made by this piping shall be waterproofed and made watertight in a manner acceptable to the Agency.

3.13 IDENTIFICATION OF PIPING

A. Unburied piping.

1. All unburied pipe including tubing, galvanized pipe and polyvinyl chloride pipe shall be coated in accordance with Division 9 of these Specifications.

2. Identification of piping other than potable water piping shall conform to ANSI A13.1.

3. Stenciled and painted labels identifying the specific nature of the pipe contents shall be affixed on the pipe to complete the pipe identification.

4. The Contractor shall submit to the Owner for review a complete listing of all piping label titles and label color schemes.

5. Labels shall be of the self-sticking type with letter sizes in accordance with ANSI A13.1.

6. Straight pipelines shall be identified at intervals of 20 feet, and at least once in each area. Piping shall also be identified within 2 feet of all turns, valves and branches.

7. On all exposed piping, black arrows of the appropriate size shall be applied adjacent to the nameplate to indicate the flow direction.

8. Labels shall be as manufactured by W.H. Brady Co., or equal.

B. Safety signs:

1. The Contractor shall furnish and install safety signs at all non-potable hose connection points. For safety signs refer to Section 10401, “Signage.”

3.14 PAINTING

A. Ferrous surfaces, except those designated elsewhere in these specifications or on the Drawings as galvanized or stainless steel, shall be shop primed. Before priming all sharp edges, burrs, welded joints, and projections, shall be ground smooth and all edges and corners rounded.

B. Machined, polished, and other ferrous and non-ferrous surfaces which are not to be painted shall be coated with rust preventative compound, Houghton "Rust Veto 344", or approved equal. Should rust occur during shipment and/or storage, the Contractor shall be responsible for correction as determined by the Agency.

C. Copper, bronze, chromium plate, nickel, stainless steel, monel metal, lead, and brass surfaces are not to be painted or finished unless called for in other parts of the Specifications or on the Drawings or as recommended by the manufacturer.

D. Galvanizing, where called for in the Specifications or on the plans shall be hot dip process conforming to ASTM A-123 and the appropriate American Hot Dip Galvanizers Association, Inc., Specifications.

1. Galvanize in the largest practical units after fabrication.

2. Electroplating will not be accepted.

3. After installation, scratched or ungalvanized surfaces shall be galvanized as directed by the Agency.

E. Unless otherwise specified, all above ground ferrous metal valves, fittings, and piping shall be shop primed for protection during delivery and storage. The shop-applied primer shall be removed by the Painting Subcontractor in the field and recoated per Section 09900, “Painting and Coating.”

F. Buried ferrous metal valves, fittings, and piping shall be coated by the manufacturer to meet the requirements specified elsewhere in the Specifications.

G. Submerged ferrous metal valves, fittings, and piping shall be primed by the manufacturer as described for above ground components and shall be sandblasted and recoated in the field by the Painting Subcontractor.

END OF SECTION

SECTION 15052

PRESSURE TESTING OF PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Hydrostatic pressure and leakage testing of pressure piping.

B. Pneumatic pressure testing of piping.

1.02 RELATED REQUIREMENTS

A. Section 01300, Submittal Procedures

B. Section 01730, Record Drawings

C. Section 15051, General Piping Requirements

D. Section 15054, Disinfection of Piping

E. Section 15061, Ductile Iron Pipe and Fittings

F. Section 15065, PVC Gravity Sewer Pipe

G. Section 15065, Small Diameter PVC Pressure Pipe.\

1.03 REFERENCES

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

ANSI B31.3 - Process Piping Code

1.04 SUBMITTALS

A. All submittals shall be submitted in accordance with Section 01300.

B. In addition, the following piping items shall be submitted:

1. Any major relocation of piping from what is shown on the Drawings.
2. Any change of materials, jointing methods, or supports from what is shown on the Drawings or what is specified these Technical Specifications.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 TESTING EQUIPMENT

A. The Contractor shall provide:

1. All necessary piping connections between the section of line being tested and the nearest available source of water supply.

2. Test pumping equipment, water meter, pressure gauge and other equipment, materials, and facilities necessary to make the specified tests.

3. All temporary sectionalizing devices and vents as required for testing. After testing, vents are to be plugged if not required for other purposes.

3.02 PRESSURE TESTING

A. Unless otherwise noted, all piping shall be field tested at a pressure of 1.5 times the pipe operating pressure and in no case less than 50 psi. or as otherwise directed by the Agency.

B. The test fluid shall be potable water unless other directed by the Agency.

C. Conduct the tests per the requirements of ANSI B31.3.

3.03 HYDROSTATIC PRESSURE TESTING OF PIPING

A. General.

1. Piping to be tested to pressures greater than 3 psi shall be tested utilizing a hydrostatic (liquid test media). Hydrostatic test procedure shall be as specified herein.

2. Test the pipe in sections not exceeding 2,500 feet, the distance between closed valves, or as directed by the Agency.

3. All piping, valves, fire hydrants, services, and related appurtenances shall be installed prior to testing.

4. All pressure gauges, sensors, and other instrumentation installed on the piping, that could be damaged due to the test pressure requirements, shall be isolated from the line being tested.

5. The pipe trench shall have trench zone backfill placed and compacted with a minimum of 24 inches of material over the pipe.

6. All thrust restraint devices shall be installed and all concrete anchor blocks and thrust blocks shall be allowed to cure a sufficient time to develop a minimum strength of 2,000 psi before testing.

7. Each pipeline shall be adequately blocked and supported before the test pressure is applied.

8. Temporary blocking during the tests will be permitted only at temporary plugs, caps or where otherwise directed by the Agency.

9. Pressure tests on exposed and aboveground piping shall be conducted only after the entire piping system has been installed and attached to pipe supports, hangers or anchors as shown on the Drawings.

10. The Contractor shall be responsible for ensuring all pipe is properly restrained.

11. Hydrostatic testing of pipelines shall be performed prior to the disinfection operations that are performed in accordance with the Section 15055, “Disinfection of Piping”.

12. The Contractor shall notify the Agency a minimum of 48 hours prior to the requested date and time for hydrostatic tests.

13. The Contractor shall furnish all labor, materials, tools, and equipment for testing.

14. All mainline valves and appurtenances shall be operated during the test period. The test shall be conducted with valves in the open position.

15. At the onset of testing, all valves, air vacuum assemblies, blowoffs, drains, and services shall be monitored for possible leakage and repairs made, if necessary, before the test proceeds. The appurtenances shall be monitored through the duration of the testing.

16. Steel pipelines shall not be tested until factory-applied mortar linings and coatings on all pipe lengths have been in place for a minimum of fourteen (14) days.

17. Steel pipelines with cement mortar field-applied to the interior of the pipeline shall not be filled with water until a minimum of eight (8) hours has elapsed after the final placement of cement mortar.

18. For pipe with a porous lining, such as cement mortar, the pipe shall be filled with water and placed under a slight pressure for a minimum of forty-eight (48) hours prior to the actual hydrostatic test.

19. The Contractor shall be responsible for exercising precaution and for the implementation of all required safety procedures when testing pipes to the pressures specified.

B. Test Water.

1. A chlorinated water solution, prepared in accordance with Section 15054, “Disinfection of Piping”, shall be used to charge the line and for make-up water when hydrostatic testing and disinfection operations are combined.

2. Well water shall not be used for hydrostatic testing or any other purposes in new or existing pipelines without the Agency approval.

3. Testing water shall be supplied through a metered connection equipped with a backflow prevention device at the point of connection to the water source.

4. The Contractor shall provide any temporary piping needed to deliver test water to the piping to be tested.

C. Test Procedure.

1. Maximum rate of filling with test fluid shall not cause water velocity in pipeline to exceed 1 foot per second.

2. Open vents such as hydrants and air release valves at high points of the piping system to purge air while filling the pipe with water. Venting during system filling may also be provided by temporarily loosening flanges.

3. A five (5) hour hydrostatic pressure test shall be performed after the pipe and all appurtenances have been installed and after any trench backfill compaction with heavy duty compaction equipment has been completed.

4. The specified test pressures shall be as measured at the horizontal centerline of the lowest point of the piping under test.

5. The test pressure shall be applied and continuously maintained by pumping for a minimum period of four (4) hours.

   a. During the pumping phase of the test, the test pressure shall be maintained at not less than ninety-five percent (95%) of the specified test pressure at all times.

   b. Examine exposed joints, fittings, valves, and connections for leaks.

c. The exposed piping system shall show zero leakage or weeping.

d. Correct the leaks and retest until zero leakage of exposed piping is obtained.

6. At the end of the fourth (4th) hour, the pressure shall meet the requirements stated above.

a. Pumping shall then be discontinued for one hour and the drop in pressure shall be recorded.

b. Pumping shall then be resumed to restore the initial test pressure, and the quantity of water pumped into the line shall be accurately measured.

c. The quantity thus measured is the amount of pipe leakage in gallons.

d. The allowable leakage for polyvinyl chloride (PVC) pipe or for steel or ductile-iron pipe with rubber joints shall be calculated using the following formula:

$$\frac{\text{5 gallons x nominal diameter of pipe (in) x length of pipe (ft)}}{\text{24 (hrs) x 5,280 (ft)}}$$

{Sample calculation: 16-inch pipe, 500 feet long. The allowable leakage is 0.316 gallons.}
{Sample calculation: 8-inch pipe, 3,000 feet long. The allowable leakage is 0.947 gallons.}

7. The allowable leakage for flanged or welded carbon steel or stainless steel pipe, for flanged ductile-iron pipe, or for flanged or solvent welded PVC pipe shall be zero.

8. If the leakage exceeds the allowable loss, the leak points shall be located and repaired as required by the Agency.

a. All defective pipe, fittings, valves, and other appurtenances discovered shall be removed and replaced with sound materials.

b. Additional disinfection shall be performed as necessary per Section 15054, “Disinfection of Piping”.

c. The hydrostatic test shall be repeated until the leakage does not exceed the amount specified above.

d. All visible leaks shall be similarly repaired.

9. The Contractor shall prepare and submit test records in a form acceptable to the Agency. The test records shall include:

a. The pipe segment being tested with reference to the applicable sheet number(s) and stations shown on the Drawings.

b. Names of all parties involved in conducting the test and names of Agency personnel witnessing the successful completion of the test.

c. Date and time of test with actual pressure and leakage values.

3.04 PNEUMATIC PRESSURE TESTING

A. General.

1. The Contractor shall furnish all labor, materials, tools, and equipment for testing. Air test equipment and gauges shall be calibrated within the past 3 months and pre-approved by the Agency.

2. All pneumatic instruments shall be isolated prior to testing. Instrument air/gas piping and tubing shall be disconnected upstream of all filters/regulators before testing.

3. All piping and tubing shall be properly anchored and supported.

4. The Contractor shall be responsible for exercising precaution and for the implementation of all required safety procedures when testing pipes to the pressures specified.

5. The dangers associated with pneumatic testing and the consequences of failure of any part of the system under test due to stored energy in a compressed gas should be recognized and suitable precautions taken.

6. The Contractor shall notify the Agency a minimum of 48 hours prior to the requested date and time for pressure tests.

B. Test Fluid.

1. For instrument air piping use clean, dry air (less than 10 ppm moisture) or nitrogen.

2. For plant air piping use clean air.

C. Test Procedure.

1. The test pressure shall be incrementally increased until the gauge pressure reaches the lesser of 50 percent of the test pressure or 25 psig.

2. Examine piping joints for leakage or pressure drop. Use soapy water or leak detection test solution such as "Snoop" by Swagelok to detect leaks.

3. If no leakage is occurring.

   a. Continue to increase the pressure incrementally.

   b. Maintain each incremental increase long enough to equalize pipe strains.

4. When the test pressure is reached, hold the pressure for one (1) hour.

5. Examine piping joints for leakage or pressure drop.

6. If no visible leakage is observed, the pressure test of the piping test segment shall be considered passing if after the 1-hour period the test pressure does not change more than five percent.

7. All pressurization steps must be repeated after performing any repair.

8. Care shall be taken to ensure testing personnel stay out of the "line of fire" of the connections being tested while conducting pressure tests and inspecting for leaks.

9. Upon completion of testing, instrument air supply lines shall be blown with instrument air prior to connecting to instruments.

10. The Contractor shall prepare and submit test records in a form acceptable to the Agency. The test records shall include:

    a. The pipe segment being tested with reference to the applicable sheet number(s) and stations shown on the Drawings.

    b. Names of all parties involved in conducting the test and names of Agency personnel witnessing the successful completion of the test.

    c. Date and time of test with actual pressure and leakage or pressure drop values.

3.05 LEAKAGE

A. It is intended that all piping shall be watertight or airtight and free from visible leaks.

B. Any leak which is discovered within one year after final acceptance of the work by the Agency shall be repaired by and at the expense of the Contractor.

END OF SECTION

SECTION 15054

DISINFECTION OF PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Disinfection by chlorination of potable water and pipelines, services, pipe appurtenances and connections by the following methods:

1. Continuous feed method.
2. Slug method.

1.02 RELATED REQUIREMENTS

A. Section 01300, Submittal Procedures

B. Section 01730, Record Drawings

C. Section 15051, General Piping Requirements

D. Section 15052, Pressure Testing of Piping

E. Section 15061, Ductile Iron Pipe and Fittings

F. Section 15065 PVC Gravity Sewer Pipe

G. Section 15066 Small-Diameter PVC Pressure Pipe

1.03 REFERENCES

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

AWWA B300 - Hypochlorites
AWWA B301 - Liquid Chlorine
AWWA C651 - Disinfecting Water Mains
AWWA - Standard Methods for the Examination of Water and Waste Water
California Domestic Water Quality and Monitoring Regulations
Code of Federal Regulations (CFR) 1910.120 Hazardous Waste Operations and Emergency Response
CFR 49.172 Hazardous Materials Regulations
General Industry Safety Orders of the California Code of Regulations, Title 8, Section 5194

1.04 SUBMITTALS

A. All submittals shall be submitted in accordance with Section 01300.

B. In addition, the following items shall be submitted:

1. A written flushing, disinfection and dechlorination plan, including all methods, sequencing, points of discharge, and equipment to be used, shall be signed by the person responsible for performing the work and shall be submitted to the Agency for approval prior to starting disinfection operations.
2. Any major relocation of piping from what is shown on the Drawings.
3. Any change of materials, jointing methods, or supports from what is shown on the Drawings or what is specified these Technical Specifications.

PART 2 - PRODUCTS

2.01 LIQUID CHLORINE

A. Liquid chlorine contains 100-percent available chlorine and is packaged in steel containers in net weights of 150 lb. or 1 ton.

B. Liquid chlorine shall be used with appropriate gas flow chlorinators, heaters, and injectors to provide a controlled, high-concentration solution feed to the water. The chlorinators and injectors shall be the vacuum-operated type.

2.02 SODIUM HYPOCHLORITE (SOLUTION)

A. Sodium hypochlorite is available in liquid form in glass or plastic containers, ranging in size from 1 Qt. to 5 Gal. The solution contains approximately 10% to 15% available chlorine.

B. Dilute a concentrated sodium hypochlorite solution with water to the desired concentration and swab or spray the inside surfaces of all new piping at connection points to existing waterlines.

2.03 CALCIUM HYPOCHLORITE (DRY)

A. Add tablets or granular hypochlorite to wet trenches when connecting to existing waterlines to minimize contamination.

2.04 CHLORINE RESIDUAL TEST KIT

A. For measuring chlorine concentration and supply, use a medium range, drop count, titration kit or an orthotolidine indicator comparator with wide range color discs.

1. Available from Hach Chemical or Hellige.
2. Maintain the kits in good working order to have available for immediate testing of residuals at points of sampling.

PART 3 - EXECUTION

3.01 APPLICATION

A. All new water mains and temporary pipelines shall be disinfected prior to connection to the Agency’s existing system.

B. All components incorporated into a connection to the Agency's existing system shall be disinfected prior to installation.

C. All water mains and appurtenances taken out of service for inspection, repairs, or other activity that might lead to contamination shall be disinfected before they are returned to service.

3.02 PROJECT SITE CONDITIONS

A. Chlorination and dechlorination shall be performed by competent individuals knowledgeable and experienced in the operation of the necessary application and safety equipment in accordance with applicable Federal, State and Local laws and regulations.

1. The transport, storage and handling of these materials shall be performed in accordance with:

   a. Code of Federal Regulations (CFR) 1910.120 Hazardous Waste Operations and Emergency Response.

   b. CFR 49.172 Hazardous Materials Regulations.

   c. General Industry Safety Orders of the California Code of Regulations, Title 8, Section 5194.

B. The discharge of chlorinated water into watercourses or surface waters is regulated by the National Pollutant Discharge Elimination System (NPDES).

1. Disposal of the chlorinated disinfection water and the flushing water is the Contractor's responsibility.

   a. The Contractor must apply to the appropriate local regulatory authority to obtain permission to discharge chlorinated water.

   b. Schedule the rate of flow and locations of discharges in advance to permit review and coordination with Agency and cognizant regulatory authorities.

2. If there is a possibility that the chlorinated discharge will cause damage to the environment, then a reducing agent shall be added to the water to be wasted to neutralize the chlorine residual remaining in the water.

   a. AWWA C651, Appendix C lists neutralizing chemicals.

C. Using potable water for chlorination.

1. If the source of potable water is from Agency waterlines, provide a reduced pressure backflow prevention assembly to the connection piping.

2. The Contractor shall submit a request for use of water from the Agency's waterlines 48 hours in advance.

3.03 PRE-DISINFECTION FLUSHING

A. Thoroughly flush main prior to disinfection.

1. Fill pipeline with potable water at a rate not to exceed 300 gpm or a velocity of 1 foot per second, whichever is less.

2. Flush per AWWA C651.

3. Continue flushing until a minimum of three exchanges of the pipe volume are achieved and the turbidity level of the water is less than or equal to 0.5 NTU. If the source water

turbidity is greater than 0.5 NTU, flushing shall continue until the pipeline turbidity is equal in turbidity to the source water.

4. Temporary end caps shall include a minimum 4-inch blow off on pipe 8 to 12 inches in diameter and a 6-inch blow off on pipe larger than 12 inches in diameter unless otherwise directed by the Agency.

3.04 CONTINUOUS FEED METHOD

A. Only vacuum-operated equipment shall be used.

1. Direct-feed chlorinators, which operate solely from gas pressure in the chlorine cylinder, shall not be permitted.

2. The equipment shall incorporate a backflow prevention device at the point of connection to the potable water source used to fill the line being tested.

B. The chlorinating agent shall be applied at the beginning of the system to be chlorinated and shall be injected through a corporation stop, a hydrant, or other approved connection to ensure treatment of the entire system being disinfected.

C. Only a certified, licensed chlorination and testing contractor shall perform gas chlorination work.

1. If required by the Agency, the chlorination contractor must also possess a Grade 2 Water Treatment Operator Certification from the State of California.

D. Introduce potable water into the pipeline at a constant measured rate.

1. Feed the chlorine solution into the inlet water at a measured rate.

2. Proportion the two rates so that the chlorine concentration in the pipeline is maintained at a minimum concentration of 50 mg/L.

3. Check the chlorine concentration at points downstream during filling the pipeline to ascertain that sufficient chlorine is being added.

3.05 SLUG METHOD

A. Disinfection of piping by the slug method is only permitted when the Contractor receives authorized from the Agency to use the slug method at specific locations in the potable water system.

B. Introduce potable water into the pipeline at a constant measured rate.

1. At the start of the test section, feed the chlorine solution into the inlet water pipeline at a measured rate so that the chlorine concentration created in the pipeline is 300 mg/L.

2. Feed the chlorine for a sufficient period to develop a solid column or "slug" of chlorinated water that will, as it passes along the line, expose all interior surfaces to a concentration of at least 300 mg/L for at least three hours.

3.06 CONFIRMATION OF RESIDUAL

A. After the chlorine solution applied by the continuous feed method has been retained in the pipeline for 24 hours, confirm that a chlorine residual of 25 mg/L minimum exists along the pipeline by sampling at air valves and other points of access.

B. With slug method, confirm the chlorine residual by sampling as the slug passes each access point and as it leaves the pipeline.

3.07 DISCHARGE OF CHLORINATED WATER

A. Indiscriminate onsite disposal or discharge to sewer systems, storm drains, drainage courses or surface waters is prohibited.

B. After confirming the chlorine residual, flush the excess chlorine solution from the pipeline until the chlorine concentration in the water leaving the pipe is non-detectable. It shall be the responsibility of the Contractor to evaluate, obtain, and comply with the provisions of the applicable NPDES General Permit for Discharges of Hydrostatic Test Water.

1. Any indication that the discharge of chlorinated water may cause damage to the environment shall require the neutralizing of the chlorine residual by means of a reducing agent in accordance with AWWA C651 and the requirements of this specification.

3.08 DISINFECTION OF VALVES AND APPURTENANCES

A. During the period that the chlorine solution or slug is in the section of pipeline, open and close valves to obtain a chlorine residual at hydrants and other pipeline appurtenances.

3.09 DISINFECTION AT SHORT-LENGTH TIE-INS

A. Pipes, fittings, valves and all other components incorporated into connections to the Agency's existing system with an assembly length of 20 feet or less shall be spray disinfected or swabbed with a liquid chlorine solution.

1. The procedure shall be in accordance with AWWA C651 and as specified herein.
2. Upon connection to the main, the line shall be flushed and tested as directed by the Agency.

3.10 RE-DISINFECTION

1. Failure to pass Bacteriological Testing will require that new facilities be adequately isolated from existing facilities and re-disinfected and re-tested until the new facilities pass the required tests.
2. Costs for additional disinfection, sampling and testing shall be paid for by Contractor.
3. Alternate methods such as "pre-disinfection" prior to installation in accordance with AWWA C651 may be required at the discretion of the Agency.

3.11 BACTERIOLOGIC QUALITY TESTS

A. The Contractor shall provide the services of an acceptable state certified laboratory to take all samples, deliver samples to the laboratory, and provide written test results to the Agency.

1. The testing methodology employed by the state certified laboratory shall be as set forth in "Standard Methods for the Examination of Water and Waste Water".
2. Testing requirements are as set forth in the California Domestic Water Quality and Monitoring Regulations.

B. Perform bacteriologic quality testing after disinfection, final flushing, and refilling of the pipeline.

1. Take samples from the pipeline at 1500-foot intervals and from each end.

2. In addition, samples shall be taken at all pipeline branches and dead ends.

3. Repeat the sample collection process 24 hours later at the same sample points.

4. The sample point spacing may be adjusted in the field by the Agency.

C. Deliver samples to a certified laboratory within three hours after collecting and have the bacteriologic quality tests performed.

1. Coordinate the collection of the samples with the laboratory's hours of operation and allow adequate time for the test results.

2. Test for coliform organisms and perform a heterotrophic plate count for each sample taken.

D. All samples must pass the following tests:

1. Coliform Bacteria Test: No positive samples allowed.

2. Heterotrophic Plate Count (HPC) Test: No more than 500 colony-forming units allowed in any sample.

a. The requirement for HPC testing may be waived at the sole discretion of the Agency.

3.12 REPETITION OF PROCEDURE

A. If the initial disinfection fails to produce the required residuals and bacteriologic quality results:

1. Conduct investigations into the cause of the contamination and correct the condition.

2. Repeat the disinfection process and the testing until satisfactory results are obtained.

B. Any alterations to already approved systems may be subject to additional bacteriological testing as directed by the Agency at no additional cost to the Agency.

3.13 TEST FACILITY REMOVAL

A. After satisfactory disinfection:

1. Replace air valves, restore the pipe coating, and complete any pipeline work where temporary distribution or test facilities were installed.

3.14 FINAL CONNECTIONS TO EXISTING WATERLINES

A. New waterlines and appurtenances shall be completely installed, disinfected, flushed, and satisfactory bacteriological sample results received prior to permanent connections being made to the active distribution system.

1. Sanitary construction practices shall be followed during installation of the final connection, such that there is no contamination of the new or existing waterlines with foreign material or groundwater.

2. Contractor shall schedule connections to existing pipelines within 10 working days or as otherwise required by the Agency.

a. If the Contractor exceeds the 10 working-day timeframe to schedule connections to existing pipelines, additional sampling and testing may be required at the discretion of the Agency.

3. Refer to Section 15051, “General Piping Requirements” for additional requirements.

3.15 CUTTING INTO EXISTING WATERLINES

A. When connecting to existing waterlines,

1. Use extreme caution to minimize contamination of the interior passageways of the existing pipe, valves, and fittings.
2. If the trench is wet, apply liberal quantities of hypochlorite to open trench areas to lessen the danger of contamination. Use tablets in this situation for slow and continuous release of hypochlorite as water is pumped from the excavation.
3. Prior to the installation of new piping, swab or spray the interior surfaces of all pipe, valves, and fittings with a 1-percent hypochlorite solution.
4. Refer to Section 15051, "General Piping Requirements" for additional requirements.

B. Within 24 hours of making a connection to an existing waterline, a bacteriologic quality test shall be performed by a state certified laboratory.

1. Collect a sample from the existing waterline at the nearest access point to the connection.
2. The sample shall be collected, delivered, and tested as described in paragraph 3.10.
3. If the sample fails the test, the Agency will direct the Contractor to perform corrective action and retest.

END OF SECTION

SECTION 15061

DUCTILE IRON PIPE AND FITTINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Ductile Iron Pipe

B. Ductile Iron Fittings.

1.02 RELATED REQUIREMENTS

A. Section 01300, Submittal Procedures

B. Section 02223, Trenching, Backfilling and Compaction

C. Section 02160, Sheeting, Shoring and Bracing

D. Section 09900, Painting and Coating

E. Section 15051, General Piping Requirements

F. Section 15052, Pressure Testing of Piping

G. Section 15054, Disinfection of Piping

H. Section 15066, Small-Diameter PVC Pressure Pipe

I. Section 15165, Mechanical Pipe Couplings.

1.03 REFERENCES

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water

AWWA C105 - Polyethylene Encasement for Ductile Iron Pipe Systems

AWWA C110 - Ductile-Iron and Gray-Iron Fittings, 3 Inch through 48 Inch for Water

AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

AWWA C115 - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges

AWWA C150 - Thickness Design of Ductile-Iron Pipe

AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast for Water

AWWA C153 - Ductile-Iron Compact Fittings

AWWA C207 - Steel Pipe Flanges for Waterworks Service – Sizes 4 In. Through 144 In.

AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances

AWWA C606 - Grooved and Shouldered Joints

AWWA M41 - Ductile-Iron Pipe and Fittings

ASTM A193 - Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and other Special Purpose Applications

ASTM A194M - Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both

ASTM A307 - Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength

ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts

ASTM A320M - Alloy-Steel and Stainless Steel Bolting for Low-Temperature Service.

ASTM C 150 - Standard Specification for Portland Cement

ANSI B2.1 - American National Standard Taper Pipe Threads

ANSI B16.1 - Gray Iron Pipe Flanges and Flanged Fittings, Classes 25, 125 and 250

ISO 817901 - Ductile Iron Pipes-External Zinc-based Coating-Part 1: Metallic Zinc with Finishing Layer (ISO 2004)

1.04 SUBMITTALS

A. All submittals shall be submitted in accordance with Section 01300.

B. See Section 15051, “General Piping Requirements” for additional piping submittal requirements.

C. Submit tabulated layout schedule and drawing showing location and dimensions of pipe and fittings including:

1. Pipe station and top of pipe or centerline elevation at each change of grade and alignment.
2. Elements of curves and bends, both in horizontal and vertical alignment, including elements of the resultant true angular deflections in cases of combined curvature.
3. The limits of each reach of pipe pressure class or thickness class and of restrained joints.
4. The limits of each reach of concrete encasement or encasement in casing.
5. Locations and details of bulkhead for field hydrostatic testing of the pipeline.
6. Locations of closures for length adjustment and for construction convenience.
7. Locations of manholes and other points of access for placement of mortar lining at field joints and removal of test bulkheads.
8. Locations of valves and other mechanical equipment.

D. In addition, the following piping items shall be submitted:

1. Any major relocation of piping from what is shown on the Drawings.
2. Any change of materials, jointing methods, or supports from what is shown on the Drawings or what is specified these Technical Specifications.

E. The manufacturer of each shipment of pipe or fittings shall be required to supply a statement certifying that each lot or load of pipe has been subjected to and meets the tests specified for ductile-

iron pipe and ductile iron fittings required in the applicable references per AWWA C110, C111, C115, C150, C151 and C153.

F. Submit certificate that cement for mortar lining complies with ASTM C150, designating type.

1.05 PIPE SCHEDULE

A. Refer to the Drawings for the Pipe Schedule.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Ductile iron pipe shall be manufactured by one of the following:

1. US Pipe and Foundry Company
2. American Pipe

B. Ductile iron fittings shall be manufactured by one of the following:

1. US Pipe and Foundry Company
2. SIP Industries
3. Tyler Union
4. Sigma Corporation
5. Star Pipe Products
6. American Pipe
7. EBBA Iron
8. Victaulic

2.02 DESIGN REQUIREMENTS

A. General:

1. Ductile-iron pipe shall be manufactured per AWWA C111, C115, C150, and C151.
2. Ductile-iron fittings shall be manufactured per AWWA C110, C111, and C153.
    a. Gray-iron or cast-iron fittings shall not be used.
    b. Gray iron or cast-iron flanges shall not be used
3. Ductile-iron pipe shall be provided in standard 18-foot or 20-foot lengths unless otherwise detailed.
    a. When deep trenches or shoring restrictions hinder the use of the standard length sections, shorter lengths shall be allowed with the concurrence of the Agency.
    b. Random lengths are not allowed.
4. The minimum length of ductile-iron pipe sections used for tie-ins and stub-outs shall be three (3) times the nominal pipe diameter or 48 inches, whichever is longer, unless otherwise approved by the Agency.

5. Joints for ductile-iron pipe and fittings shall be push-on, flanged, mechanical, or grooved-shouldered in accordance with AWWA C110, C111, C115, C153, and C606 unless otherwise indicated on the Drawings.

    a. Joints that are aboveground or within structures shall be flanged unless otherwise shown on the Drawings.

    b. Grooved-shouldered joints maybe be used only when shown on the Drawings or approved by the Agency.

6. Joints for ductile-iron pipe and fittings shall have a pressure rating equal to or greater than the adjacent piping, unless shown otherwise on the Drawings or in these Specifications.

7. Horizontal Radius and Pipe Deflections:

    a. In locations where it is required to lay ductile-iron pipe along curves or install pipe deflections, the deflections shall be at joints in accordance with the requirements of AWWA C600.

    b. Pipe segments shall not be bent to form arcs.

B. Ductile-iron pipe flanges shall be shop-threaded in accordance with AWWA C115 and rated at a working pressure of 250 psi unless otherwise shown on the Drawings.

1. The flanges shall be rated at a working pressure of 250 psi. where required to connect to the flanges of 250 psi valves or other appurtenances.

2. Ductile-iron flanges shall be compatible with AWWA C207, Class “F” steel flanges.

3. Gray-iron, cast-iron, or hollow-back flanges are not permitted.

4. Threading of flanges in the field is not permitted.

5. Ductile-iron flanged fittings that are integrally cast in accordance with AWWA C110 and C153, shall be rated at a working pressure of 250 psi.

C. Plain ends of ductile-iron pipe shall conform to the requirements of AWWA C151 to accept mechanical or push-on joints, flanged coupling adaptors, flexible couplings, or grooved couplings.

2.03 PIPE AND FITTINGS

A. Pipe

1. The minimum pressure classes of ductile-iron pipe with various couplings connections are listed below unless shown otherwise on the Drawings.

    a. For push-on, mechanical joint or plain end couplings:

        1. Pipe Diameter under 20 inches - Pressure Class 350
        2. Pipe Diameter 20 to 24 inches - Pressure Class 300
        3. Pipe Diameter 30 to 36 inches - Pressure Class 250
        4. Pipe Diameter over 36 inches - Pressure Class 200

    b. For grooved end couplings connections:

        1. Pipe Diameter under 20 inches – Special Thickness Class 53
        2. Pipe Diameter 20 inches – Special Thickness Class 54
        3. Pipe Diameter over 20 inches – Special Thickness Class 56

    c. For ductile-iron pipe with threaded flanges or threaded shoulders the minimum pressure class shall be Special Thickness Class 53.

d. For all pipe with less than 2.5 feet of cover the minimum pressure class shall be Special Thickness Class 53.

B. Fittings

1. Ductile iron fittings for use with ductile iron pipe shall be new and of current manufacture.

2. Ductile iron fittings shall be lined as specified herein.

3. Ends shall be flanged, grooved, mechanical joint or push-on as shown on the Drawings.

4. All fittings for ductile iron pipe shall meet, as a minimum, the requirements of the following standards:

a. Flanged and Grooved Fittings: 3" to 48": AWWA C110 with ANSI B16.1 Class125 Flanges.

b. Mechanical Joint and Push-On Fittings: 3" to 48": AWWA C153 with AWWA C111 Joints.

2.04 PIPE COATING AND LINING

A. The exterior surfaces of above ground pipe, fittings, couplings, supports and accessories shall be painted as specified in Section 09900.

1. Exposed (above ground) ductile iron pipe shall be shipped to site without the standard asphaltic coating, but with a primer coat suitable for use with the field coating system.

B. Below ground ductile-iron pipe and fittings.

1. The exterior surfaces of ductile iron pipe shall be factory-coated with a minimum one (1) mil thick asphaltic coating in accordance with AWWA C151.

2. The exterior surfaces of ductile iron pipe shall be factory-coated with metallic zinc coating applied with an arc spray process with a minimum one (1) mil thick asphaltic top coat in accordance with ISO 8179-1.

3. The exterior surfaces of ductile-iron fittings shall be factory-coated with a minimum one (1) mil thick petroleum asphaltic material per AWWA C110 and C153.

4. The Agency may require alternative coatings based on special conditions and the Corrosion Engineer’s recommendations.

a. Additional coating requirements, if any, shall be shown on the Drawings.

C. Materials for field coating buried pipe, fittings, joints and hardware shall be in accordance Section 09900.

D. Ductile-iron pipe and fittings, when used for potable water, shall be cement-mortar lined in accordance with AWWA C104.

1. Cement-mortar shall be in accordance with ASTM C 150, Type II or Type V.

E. Ductile-iron pipe and fittings, when used for wastewater, shall be lined with Series 431 Perma-shield PL cement mortar lining as manufactured by Tnemec Company, or Equal.

2.05 POLYETHYLENE ENCASEMENT

A. Refer to Section 15051, “General Piping Requirements”.

B. Polyethylene film shall include an anti-microbial infused linear low density polyethylene film to inhibit corrosion. Film shall be V-Bio by U.S. Pipe or approved equal.

2.06 JOINT RESTRAINTS

A. Joint restraints shall be installed where shown on the Drawings and where concrete thrust blocks are not practical, with the approval of the Agency.

1. Joint restraints for piping 8-inches and diameter shall be push-on type with locking gasket rated for 250 psi operating pressure (Field-Lok gaskets by U.S. Pipe or approved equal). TR-Flex restrained joint pipe by U.S. Pipe or approved equal is also acceptable.
2. Joint restraints for piping 10-inches in diameter and larger shall be boltless push-on design with a positive axial lock between the bell interior surface and a retainer weldment on the spigot end of the pipe and be capable of deflection after assembly (TR-Flex by U.S. Pipe, or approved equal).
3. Pipe field weldments for restrained joints are not permitted. Restraint of field cut pipe shall be with mechanical joint restraint (EBAA Iron, Inc. Megalug Series 1100, or approved equal).
4. Field cutting of restrained joint pipe shall be minimized.

2.07 CONNECTIONS

A. General

1. For above ground pipe, all fittings, couplings, and appurtenances use flanged or grooved joints, except where otherwise shown on the Drawings.
2. For below ground pressure pipe, all buried pipe joints at changes in pipe diameter or direction (line or grade), valves, fittings or other pipeline components shall be restrained.
3. For below ground gravity flow pipe and fittings use push-on joints, except where otherwise shown on the Drawings.
4. Refer to Section 15165, “Mechanical Pipe Couplings” for additional requirements.

2.08 BOLTS AND NUTS

A. Refer to Section 15051, “General Piping Requirements” for requirements.

2.09 GASKETS

A. Mechanical-joint rubber gasket configuration and materials shall comply with AWWA C111 and shall be in accordance with the applicable joint type and pressure rating of the piping system.

B. Flange gaskets shall be 1/8-inch thick aramid fiber bound with nitrile for all sizes of pipe.

1. Gaskets shall be full-face type with pre-punched holes or ring-type extending to the inner edge of the bolt circumference of the flange.
2. Ring-type gaskets may only be used as directed by the Agency.

C. Push-on joint rubber gaskets shall be per AWWA C111.

D. If soil contaminated with organic solvents or petroleum products are encountered during the course of the work, alternate gasket materials or joint treatment may be required by the Agency.

PART 3 - EXECUTION

3.01 GENERAL

A. Install ductile iron pipe in conformance with AWWA C600.

B. Ductile iron fittings shall be installed in accordance with AWWA C600, the manufacturer's recommendations and as shown on the Drawings.

C. Handling and cleaning.

1. Refer to Section 15051, "General Piping Requirements" for requirements.

D. Trenching, backfilling and compacting.

1. Refer to Section 02223, "Trenching, Backfilling and Compaction" for requirements.

E. Dewatering

1. Refer to Section 02140, "Dewatering" for requirements.

F. Supports

1. All ductile iron fittings require support to prevent the fittings weight from being carried by the adjacent pipe.
    a. Refer to Section 15090, "Pipe Hangers and Supports" for requirements.
    b. Support may also be provided by concrete support blocks at locations approved by the Agency.

G. Cathodic protection.

1. Refer to the Drawings for the use of corrosion control materials and equipment.
2. Refer to Section 13110, "Corrosion Control for Buried Piping" for requirements.

H. Thrust restraint.

1. Refer to Section 15051, "General Piping Requirements" for requirements.

I. Identification of piping.

1. Refer to Section 15051, "General Piping Requirements" for requirements.

J. Polyethylene encasement.

1. Wrap all buried ductile iron pipe, fittings, and flanged joints with polyethylene encasement. Refer to Section 15051, "General Piping Requirements" for requirements.

K. Warning tape, Tracer wire.

1. Refer to Section 15051, "General Piping Requirements" for requirements.

L. Pressure testing of pipe.

1. Refer to Section 15052, "Pressure Testing of Piping" for requirements.

M. Disinfection of piping.

1. Refer to Section 15054, “Disinfection of Piping” for requirements.

END OF SECTION

SECTION 15065

PVC GRAVITY SEWER PIPE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Materials, installation, and testing of PVC gravity sewer pipe conforming to ASTM D3034. Size range is 2 through 24 inches.

1.02 RELATED REQUIREMENTS

A. Section 01300, Submittal Procedures

B. Section 02223, Trenching, Backfilling and Compaction

C. Section 02160, Sheeting, Shoring and Bracing

D. Section 15051, General Piping Requirements

E. Section 15165, Mechanical Pipe Couplings

1.03 REFERENCES

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications

ASTM D3034 – Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings

ASTM D3212 – Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

ASTM F477 – Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

ASTM D1784 – Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds

ASTM D1785 – Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120

1.04 SUBMITTALS

A. Submittals shall be in accordance with Section 01300, “Submittal Procedures”.

B. Refer to Section 15051, “General Piping Requirements” for additional piping submittal requirements.

C. Submit reports on testing per ASTM D3034 or ASTM F789 (pipes 2 inches through 24 inches).

D. Submit cut sheets showing invert elevations, ground elevations, and cuts every 25 feet. Show lateral locations.

E. In addition, the following piping items shall be submitted:

1. Any major relocation of piping from what is shown on the Drawings.

2. Any change of materials, jointing methods, or supports from what is shown on the Drawings or what is specified these Technical Specifications.

1.05 PIPE SCHEDULE

A. Refer to the Drawings for the Pipe Schedule.

1.06 QUALITY ASSURANCE

A. PVC gravity sewer and drain pipe shall be obtained from a manufacturer who has a continuous quality control program.

1. All PVC plastic molding materials used to manufacture pipe and fittings under this Section shall be tested for conformance to the requirements of ASTM D1784 and ASTM D1785.

2. Submit test results in accordance with Section 01300, “Submittal Procedures”.

B. The manufacturer of each shipment of pipe shall be required to supply a statement certifying that each lot or load of pipe has been subjected to the tests specified for PVC pipe, and has been found to meet all the requirements of ASTM D3034.

C. PVC pipe that has been contaminated in any way with petroleum products (on the inside or outside of the pipe) shall not be used.

D. All pipe of the same type shall be the product of one manufacturer.

PART 2 - MATERIALS

2.01 MANUFACTURER

A. PVC gravity sewer and drain pipe shall be manufactured by one of the following:

1. J M Eagle

2. Vinyltech

3. IPEX

4. NAPCO

2.02 DESIGN REQUIREMENTS

A. Pipe 2 through 24 inches shall conform to ASTM D3034, SDR 35, unless otherwise indicated in the Pipe Schedule or Drawings.

B. Joints:

1. Provide elastomeric gasket joints of the push-on type, conforming to ASTM D3212.

C. Gaskets:

1. Gaskets for push-on joints shall conform to ASTM F477.

D. Fittings:

1. Fittings for pipe 4 through 12 inches shall be PVC conform to ASTM D3034, SDR 35, or ASTM F789.

E. Couplings for joining PVC pipe segments shall be according to Section 15165, "Mechanical Pipe Couplings."

2.03 PVC PIPE

A. Additives and fillers, including stabilizers, antioxidants, lubricants, colorants, etc., shall not exceed 10 parts by weight per 100 of PVC resin in the compound.

B. Each piece of pipe shall be plainly marked at the manufacturer with dimension ratio. All piping shall be readily identifiable.

C. Plastic Compounds shall be ASTM D1784, Class PVC 12454-B for polyvinyl chloride.

2.04 MANDREL FOR FIELD TESTING OF PIPE DEFLECTION

A. Be a rigid, nonadjustable, odd-numbering-leg (nine legs minimum) mandrel having an effective length not less than its nominal diameter.

B. Have a minimum diameter at any point along the full length as follows:

Pipe Material	Nominal Pipe Size (inches)	Minimum Mandrel Diameter (inches)
PVC-ASTM D3034 (SDR 35)	6	5.619
	8	7.524
	10	9.405
	12	11.191

C. Be fabricated of steel; be fitted with pulling rings at each end; be stamped or engraved on some segment other than a runner indicating the pipe material specification, nominal size, and mandrel outside diameter (e.g., PVC, D 3034-8"-7.524"); and be furnished in a carrying case labeled with the same data as stamped or engraved on the mandrel.

D. All costs incurred by the Contractor attributable to mandrel and deflection testing, including any delays, shall be borne by the Contractor at no cost to the Agency.

PART 3 - EXECUTION

3.01 GENERAL

A. Install in conformance with ASTM D2321, the manufacturer's recommendations, and as shown on the Drawings.

B. Trenching, backfilling and compacting.

1. Refer to Section 02223, “Trenching, Backfilling and Compaction” for requirements.

C. Dewatering

1. Refer to Section 02140, “Dewatering” for requirements.

D. Identification of piping.

1. Refer to Section 15051, “General Piping Requirements” for requirements.

E. Support of excavations.

1. Refer to Section 02160, “Sheeting, Shoring and Bracing.”

3.02 INSTALLING PVC SEWER PIPE

A. Lay pipe without break, upgrade from structure to structure, with the socket ends of the pipe upgrade.

B. Do not use the pipe as a drain for removing water that has infiltrated into the trench.

C. Do not use hydro-hammers to compact bedding or backfill.

3.03 INSTALLING LATERALS

A. Each wye branch fitting shall have its barrel diameter equal to the diameter of the sanitary sewer main and the spur (or branch) diameter as indicated in the Drawings.

B. Do not place wye branches within 5 feet of any structure or manhole.

C. Install wye fittings so that the outlet branch is inclined upward at an angle of 45 degrees. Plug wye branch fittings that are to be left unconnected with a stopper or plug. Join laterals to wye branch fittings at the sanitary sewer main by eighth bends. Eighth bends and quarter bends are a part of lateral sewer line.

D. No laterals shall be connected directly into manholes or structures.

E. End of the lateral shall be at least 3 feet below the existing or proposed grade of the ground at existing structure to be served or as called for in the drawings.

F. Where possible, laterals shall run perpendicular to the sewer main at a minimum grade of 1%. Bed laterals the same as the sewer main into which they connect.

G. Plug laterals with stopper in the socket of the last joint. Seal stopper in place so that it will withstand the internal pressure during the test for leakage and so that it may be removed without damage to the socket.

H. Mark the location of each lateral by chiseling a letter "S" 1-1/2 inches high on the top of the curb. If the terminal point of the lateral is more than 8 feet beyond the curb line or curb improvements do not exist, provide and install a 4-inch by 4-inch by 3-foot 0-inch stake extending 2 inches above the ground and placed at the end of the connection.

3.04 INSTALLING PIPE AT MANHOLES AND STRUCTURES

A. Place a 2-foot PVC length of pipe of the same inside diameter as the adjoining pipe at the inlet and outlet to each manhole or structure.

B. Directly cast a manhole sand collar into the manhole base.

3.05 FIELD QUALITY CONTROL

A. Testing for Defects.

1. Following placement and compaction of backfill and prior to placing permanent pavement, use a sewer cleaning ball to clean the pipe of all debris (catch and remove all debris from downstream manhole) and mandrel the pipe (95% diameter mandrel) to measure for obstructions (excessive deflections, joint offsets, and lateral pipe intrusions).

B. Testing for Pipe Deflection.

1. Test installed pipe to ensure that vertical deflections for plastic pipe do not exceed the maximum allowable deflection. Maximum allowable deflections shall be governed by the mandrel requirements stated herein and shall nominally be:

Nominal Pipe Size	Percentage
Up to and including 12 inches	5.0

2. The maximum average inside diameter shall be equal to the average outside diameter per applicable ASTM standard minus two minimum wall thicknesses per applicable ASTM standards. Manufacturing and other tolerances shall not be considered for determining maximum allowable deflections.

3. Perform deflection tests not sooner than 30 days after completion of placement and compaction of backfill. Clean and inspect the pipe for offsets and obstructions prior to testing.

4. Pull a mandrel through the pipe by hand to verify that maximum allowable deflections have not been exceeded. Prior to use, the mandrel shall be certified by an independent testing laboratory. Use of an uncertified mandrel or a mandrel altered or modified after certification will invalidate test. If the mandrel fails to pass, the pipe will be deemed to be over deflected.

5. Uncover any over deflected pipe and, if not damaged, reinstall. Remove damaged pipe from the site. Any pipe subjected to any method or process other than removal, which attempts, even successfully, to reduce or cure any over deflection, shall be uncovered, removed from the site, and replaced with new pipe.

6. All PVC main line pipe shall be tested for deflection, joint displacement, or other obstruction by passing a rigid mandrel through the pipe by hand, from manhole to manhole, not less than 30 days after completion of the trench backfill, but prior to permanent resurfacing. The mandrel shall be a full circle, solid cylinder, or a cylinder, approved by the District as to design and manufacture. The circular cross section of the mandrel shall have a diameter of at least 95 percent of the specified average inside pipe diameter of the pipe.

7. Contractor will install sewer traps in downstream manholes to protect existing system from debris when the new lines are tested. The new sewer system will be pressure washed prior to removing traps after instating the new system. Contractor to clean traps with a vactor truck during the duration of the project and as directed by Agency.

C. Leakage Test.

1. Test for leakage by means of an air test. Conduct air tests per F1417, Table 1. Test each section of pipe between manholes, along with the manholes.

2. Test each section of pipe between two successive manholes by plugging pipe outlets with test plugs. Add air slowly until the internal pressure is raised to 4.0 psig. The compressor used to add air to the pipe shall have a blowoff valve set at 5 psig so that the internal pressure in the pipe never exceeds 5 psig. Maintain the internal pressure of 4 psig for at least two minutes to allow the air temperature to stabilize, then disconnect the air supply and allow the pressure to decrease to 3.5 psig. Measure the time in minutes that is required for the internal air pressure to drop from 3.5 psig to 2.5 psig. If the pressure drop from 3.5 psig to 2.5 psig occurs in less time than the specified values, overhaul the pipe and, if necessary, replace and re-lay the pipe until the joints and pipe hold satisfactorily under this test.

3. Guard against the sudden expulsion of a poorly installed plug or a plug that is partially deflated.

3.06 TESTING FOR ALIGNMENT AND GRADE

A. Testing for Alignment and Grade.

1. After the pipe has been installed, tested for leakage, backfilled to existing grade, and manholes raised to grade and resurfaced, "ball" the pipe from manhole to manhole with a sewer cleaning ball such as Cherne Jet-ball pipeline cleaning ball or approved equal.

2. Contractor shall CCTV video tape new sewer and drain lines (with running water) for discrepancies and will provide the Agency with a DVD copy and a written report. CCTV video camera to have a gauge to determine depth of sags (gauge must be approved by the Agency prior to CCTV). Sags greater than ½" to be repaired by Contractor at no cost to Agency. If deficiencies are observed the contractor will make all repairs and upon completing the corrective work, notify the Agency's Representative; the affected portion of the pipeline system will be re-videoed.

END OF SECTION

SECTION 15066

SMALL-DIAMETER PVC/CPVC PRESSURE PIPE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included: Small-diameter PVC/CPVC pressure piping shall be furnished and installed where shown on the drawings complete with fittings, jointing materials, hangers, and other accessories that are shown on the drawings or are required for proper installation and functioning of the piping.

B. General Piping Stipulations: The General Piping Stipulations shall apply to piping furnished under this section.

1.02 DESIGN REQUIREMENTS

A. PVC/CPVC pipe shall be provided in standard 6.10m (20') lengths, unless otherwise detailed or required on the Approved Plans. When deep trenches or shoring restrictions hinder the use of the standard length sections, the use of 3.05m (10') and 4.57m (15') lengths shall be allowed. Random lengths are not allowed.

B. The minimum length of PVC/CPVC sections used for tie-ins and stub-outs shall be three (3) times the pipe diameter or 1200mm (48”), whichever is longer, unless otherwise approved by the City Engineer.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer(s) of the piping furnished under this Section shall have experience in providing similar type of piping and shall show evidence with his submittal of at least five (5) installations where the piping of the same material and same application of the type specified herein have been in satisfactory operation for at least five (5) years. All piping of the same type shall each be the product of one manufacturer.

B. Reference Standards: Comply with applicable provisions and recommendations of the following:

1. Standards of American Water Works Association, AWWA.
2. Standards of American Society for Testing and Materials, ASTM.
3. Standards of American National Standards Institute, ANSI.
4. Standards of National Electrical Manufacturer's Association, NEMA.
5. National Sanitation Foundation, NSF.

C. Manufacturer: Plastic piping shall be obtained from a manufacturer who has a continuous quality control program. All PVC/CPVC plastic molding materials used to manufacture pipe and fittings under this Section shall be tested for conformance to the requirements of ASTM D 1784 and ASTM D 1785. Submit results of the tests.

D. PVC/CPVC pipe and couplings shall bear a “home” mark on the spigot end to indicate proper penetration when the joint is made. The pipe markings for PVC/CPVC pipe for recycled water

systems shall include the designation “RECYCLED WATER” in addition to the identification markings required by AWWA.

1.04 SUBMITTALS

A. Shop Drawings: Submit detailed drawings and data for piping.

B. Certificates: Submit certificates of compliance with applicable referenced standards.

C. Technical Manuals: Complete operation and maintenance instruction, lubrication schedules and troubleshooting guides shall be submitted for review in accordance with the procedures and requirements set forth in Section 01300.

1.05 PRODUCTION, DELIVERY, STORAGE, AND HANDLING

A. Prior to Shipment:

1. Each piece of pipe shall be plainly marked at the manufacturer with schedule number and pressure class. All piping shall be readily identifiable.

2. All piping shall be thoroughly cleaned of sand, scale, rust or other foreign substances. Open ends of piping shall be suitably closed to prevent the entrance of foreign matter after cleaning and during shipment and storage.

B. Delivery, Storage and Handling of Materials: All materials shall be delivered to the site, stored, and handled in accordance with the manufacturer's instructions. Contractor shall inspect shipments for damage and content well in advance of the date scheduled for incorporation in the Work.

C. PVC/CPVC pipe shall be stored in suppliers' yards and on the job site in accordance with AWWA M23 and the manufacturer's recommendations. Store PVC/CPVC pipe in the field by supporting the pipe uniformly in accordance with AWWA M23. Pipe shall not be stacked higher than 1.22m (4’) or with weight on the bell ends.

D. Cover stored PVC/CPVC pipe with an opaque material to protect it from the sun's ultraviolet radiation. PVC/CPVC pipe that has been subjected to excess ultraviolet radiation as identified by color fading or chalking shall not be used. The determination as to the acceptability of PVC/CPVC pipe shall rest solely with the City Engineer.

E. PVC/CPVC pipe that has been contaminated in any way with petroleum products (on the inside or outside of the pipe) shall not be used.

1.06 JOINT RESTRAINT

A. Joint restraint systems in accordance with Section 15165, “Mechanical Pipe Couplings” shall be used where indicated on the Approved Plans or where concrete thrust blocks are not practical, with the prior approval of the City Engineer.

1.07 TRACER WIRE

A. Tracer wire shall be installed for all PVC/CPVC water mains, whether potable or recycled, in accordance with Section 15051, “General Pipe Requirements.”

1.08 WARNING/IDENTIFICATION TAPE

A. Warning/Identification tape shall be installed for all PVC/CPVC water mains, whether potable or recycled, in accordance with Section 15051, "General Piping Requirements."

1.09 RECYCLED WATER IDENTIFICATION

A. PVC/CPVC pipe for recycled water system applications shall be purple. Fittings and pipe appurtenances installed with PVC/CPVC mains for recycled water shall be identified with purple-colored coating, purple polyethylene sleeves, identification labels, or signs in accordance with W.AS. Specifications 15151 and 15152.

PART 2 - PRODUCTS

2.01 PVC/CPVC PRESSURE PIPE

A. General: Unless otherwise specified or shown on the drawings the material for PVC/CPVC pressure pipe, fittings, and appurtenances shall be as follows:

B. Plastic Pressure Pipe Compounds: The rigid unplasticized compound from which the PVC/CPVC pressure pipe, fittings, and appurtenances shall be made conforming to ASTM D1784, Class PVC/CPVC 12454-B for polyvinyl chloride. All PVC/CPVC piping shall contain a minimum of 2% TiO_2 (Titanium Dioxide).

C. PVC/CPVC Quality Standards and Identification: PVC/CPVC pressure pipe, fittings and appurtenances shall conform to the applicable requirements of ASTM D 1785 and shall be of the same color. PVC/CPVC pipe and fittings shall be approved for potable water service and shall bear the seal of approval of the N.S.F. or another accredited testing laboratory.

D. Pipe:

Above Ground	All PVC/CPVC pipe shall be Schedule 80 and shall conform to ASTM D 1785: PVC/CPVC 1120.
Below Ground	
Up to 3"	All PVC/CPVC pipe shall be Schedule 80 and shall conform to ASTM D 1785: PVC/CPVC 1120.

E. Fittings: PVC/CPVC fittings shall be Schedule 80 conforming to ASTM D 2467 for socket type, ASTM D 2464 for threaded type and ASTM D 2241 for push-on type and mechanical joint. Flanges shall be 150-pound, flat-face, socket type unless otherwise shown. The outside diameter and drilling of flanges shall conform to ANSI B16.5, Class 150.

F. Flange Gaskets: Neoprene full-face gaskets 1/8-inch thick of 45 to 60 durometer ("A" scale) hardness are required for flanged joints; excepting, that for chlorine solution service the gasket material shall be natural rubber, 1/8-inch thick gasket sheet and of 75, plus or minus 5, durometer ("A" scale) hardness.

G. Flange Bolting: Bolts, washers, and nuts for making up flanged joints on PVC/CPVC pipe shall be stainless steel Type 316.

H. Solvent Primer: Socket type connections shall be primed with primer furnished by the supplier for the PVC/CPVC pipe and fittings.

I. Solvent Cement: Socket type connection shall only he jointed by heavy duty solvent cement furnished by the supplier of the PVC/CPVC pipe and fittings and shall conform to ASTM D 2564.

2.02 JOINTS FOR PVC/CPVC PRESSURE PIPE

A. General: PVC/CPVC pressure pipe fittings and appurtenances shall be provided with solvent welded joints, except where otherwise indicated on the drawings.

B. Solvent Welded Joints: Solvent welded joints shall be made in accordance with ASTM D 2855.

The ends of the plastic pipe shall be cut square and smooth, beveled, and wiped clean. Primer shall first be applied to the outside of the pipe and the inside of the fitting socket with a small paint brush. Solvent shall be applied in such a manner that no material is deposited on the interior surface of the pipe or extended into the interior of the pipe during joining. The coated surfaces shall be immediately pushed snugly together and the pipe rotated approximately 1/4 turn to insure uniform distribution of cement. Excess cement of the exterior of the joint shall be wiped clean immediately after assembly.

Care shall be exercised in assembling a pipeline with solvent welded joints so that stress on previously made joints is avoided. Handling of the pipe following jointing, suck as lowering the assembled pipeline into the trench, shall not occur prior to the set times specified in ASTM D 2855.

The pipeline shall not be exposed to water for 24 hours after the last solvent welded joint is made.

C. Threaded Joints: Where threaded joints are required on the drawings, joints shall be screwed with Teflon thread lubricant. Threaded joints shall be prepared in accordance with the manufacturer's printed instructions and these Special Provisions.

Prior to threading, a plug shall be installed in the bore of the pipe to prevent distortion.

D. Screwed Unions: In erecting exposed screwed or solvent weld PVC/CPVC piping 3" and smaller, a sufficient number of screw unions shall be installed to allow a run of pipe to be disconnected, or any valve to be removed from the line without taking down adjacent runs. The provision of an adequate number of unions shall be rigidly adhered to whether of not such fittings are indicated on the drawings.

E. Grooved Joints: Grooved coupling shall be Victaulic Style 775 or equal.

F. Push-On Joints: Where push-on joints are required on the drawings, joints shall be prepared in accordance with the manufacturer's printed instructions and these Special Provisions. Gaskets shall conform to ASTM F477 and D3139. An approved lubricant recommended by the pipe manufacturer shall be used during assembly.

G. Restraints: Joint restraint systems shall be in accordance with W.A.S. Specification 15000

2.03 CONCRETE

A. Concrete used for thrust, anchor, and support blocks shall be in accordance with Section 03000.

2.04 IMPORTED GRANULA MATERIAL FOR PIPE AND TRENCH ZONES

A. Imported granular material for use in pipe and trench zones shall be in accordance with Section 02223, “Trenching, Backfilling, and Compacting.”

PART 3 - EXECUTION

3.01 INSTALLATION

A. General:

1. PVC/CPVC pipe installation shall be in accordance with ASTM D 2774 and these Special Provisions.
2. Provision for protection of runs from damage due to thermal expansion, contraction and thrust shall be made in accordance with the manufacturer's instructions and these Special Provisions.
3. When two or more pipelines are installed in the same trench, they shall be separated by a minimum horizontal clear distance of 6 inches unless otherwise directed by the City Representative, and they shall be installed so that each pipeline, valve, or other pipeline component may be serviced or replaced without disturbing the other.
4. The pipe shall be snaked in the trench. If required by the Engineer, the pipe shall be cooled by filling it with water prior to backfilling. The pipeline shall not be exposed to water for 24 hours after the last solvent welded joint is made.
5. At all times when the work of installing the pipe is not in progress, including worker break times, the ends of the pipe shall be closed with tight-fitting, vermin-proof and child-proof caps or plugs. Do not permit trench water to enter the pipe. Do not place tools, clothing, or other materials in the pipe. The Contractor shall maintain the interior of the pipe in a sanitary condition free from foreign materials at all times.
6. Proper care shall be used to prevent damage in handling, moving and placing the pipe. All pipe, fittings, valves, and other pipeline materials shall be lowered into the trench in a manner that prevents damage. The pipe shall not be dropped, dragged or handled in a manner that will cause bruises, cracks, or other damage. PVC/CPVC pipe that has been gouged, scratched, or otherwise damaged shall be subject to rejection at the discretion of the City Engineer.
7. Where pipe lengths less than the standard 6.10m (20’) are required, the pipe sections shall be installed in accordance with the manufacturer's installation guide (with the exception of deflection at the bell and spigot, which is not allowed) and shall only be used as specified herein or with the approval of the City Engineer. The minimum pipe length permitted is 1.52m (5'), except at tie-ins and stub-outs, where the minimum pipe length permitted is three (3) times the pipe diameter or 1.22m (4’), whichever is longer, unless otherwise approved by the District Engineer.

B. Pipe Bedding: Subbedding shall be excavated to a minimum depth of two (2) inches below the bottom of the pipe barrel and this space refilled with bedding material specified in Specification 02223.

C. Dewatering: Dewatering of trench excavations shall be performed in accordance with Section 02140. If flooding of the trench does occur, the Contractor shall immediately dewater and restore the trench. Damaged or altered pipelines, appurtenances, or trench materials shall be repaired or replaced as directed by the City Engineer.

3.02 SUPPORTS

A. General:

1. Supports shall be provided at all points of directional change, including horizontal to vertical.

2. PVC/CPVC pipe shall be supported in a manner which permits contraction and expansion from temperature changes.

B. Supports and Clamps:

1. PVC/CPVC valves, check valves, and other devices in the line shall be supported so that the weight or torque applied to the device does not place undue stress on the pipe.

2. Steel fittings and valve assemblies in PVC/CPVC pipe runs shall be supported independently of the PVC/CPVC pipe so that their weight shall not be supported by or transmitted to the PVC/CPVC pipe. Where clamping of the pipe for the purpose of anchoring is required, the clamps shall be fitted with rubber or PVC/CPVC type liners.

3.03 PIPE PREPARATION

A. Prior to installation, each pipe length shall be carefully inspected, flushed clean of any debris or dust, and be straightened, if not true. Ends of threaded pipes shall be reamed and filed smooth. All pipe fittings shall be equally cleaned before assembly.

3.04 PIPE INSTALLATION

A. When the work required and the size of the pipe allows entry of personnel into the pipe, the Contractor shall comply with all Federal and State regulations for confined space entry. Work inside pipelines shall not be undertaken until all the tests and safety provisions of the Code of Federal Regulations 1910.146, and the General Industry Safety Orders of the California Code of Regulations, Title 8, Section 5159 for confined space entry have been performed and the area is verified as safe to enter.

B. The Contractor shall furnish and install all pipe, specials, fittings, closure pieces, valves, supports, bolts, nuts, gaskets, jointing materials, and all other appurtenances as shown on the Approved Plans and as required to provide a complete and workable installation. Install pipe in the trench as follows:

1. Inspect each section of pipe prior to lowering the pipe into the trench. Thoroughly clean the ends of the pipe. Remove foreign matter and dirt from inside of the pipe and keep clean during and after installation.

2. Install pipe according to the manufacturer's approved order of installation to the proper lines and grades in accordance with the Approved Plans and as follows:

   a. Install pipe uphill if the grade exceeds ten percent (10%).

   b. Installation tolerances for the pipe shall not vary more than 50mm (2”) horizontally or 25mm (1”) vertically from the alignment and elevations shown on the Approved Plans.

3. Install the pipe such that the identification markings on each pipe section are continuously aligned for the total length of the pipeline alignment. Orient the strip marking upward to the 12 o’clock position (top) of the trench opening.

C. The pipe shall have firm bearing along its full length, and bell holes shall be provided at each joint to permit visual inspection of the joint and prevent the pipe from being supported by the bell end or coupling.

D. The beveled end of the pipe shall be removed prior to insertion into a mechanical joint fitting.

E. Field cutting and milling shall be performed in accordance with the manufacturer's written instructions to equal the quality of shop-fabricated ends.

1. Pipe Assembly:

2. Push-On Type: Assemble the pipe joint using a lubricant selected from the Approved Materials List. Insert the spigot end into the bell or coupling to the proper insertion mark. Check that the elastomeric ring has not left the groove during assembly by passing a feeler gauge around the completed joint. Drive spigot ends of the pipe into bell ends in accordance with the manufacturer's recommendations. Stabbing shall not be permitted.

F. Mechanical-Joint Type: Assembly of mechanical joint fittings shall be in accordance with the manufacturer's recommendations regarding installation.

3.05 PROTECTIVE COATING

A. PVC/CPVC piping, valves, and appurtenances installed in locations exposed to sunlight shall have a protective coating against ultraviolet light. The coating shall consist of two finish coats applied to a minimum dry-film thickness of 5 mils (2-1/2 mils minimum each coat), but shall align with coating material manufacturer recommendations and approval by the Engineer. Surface preparation shall consist of solvent cleaning and shall align with coating manufacturer requirements.

B. Recommendations of the coating manufacturer shall be followed as to the type of equipment and methods of application. The coating shall be either Macropoxy 646 Fast Cure or Sher-Loxane 800, or approved equal.

3.06 DISINFECTION AND BACTERIOLOGICAL TESTING

A. Disinfection, bacteriological testing and flushing shall be performed in accordance with Section 15045.

3.07 HYDROSTATIC TESTING

A. Field hydrostatic testing shall be performed in accordance with Section 15052.

END OF SECTION

SECTION 15090

PIPE HANGERS AND SUPPORTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section includes the following hangers and supports for mechanical system piping and equipment:

1. Adjust list below to suit Project.
2. Steel pipe hangers and supports.
3. Trapeze pipe hangers.
4. Metal framing systems.
5. Thermal-hanger shield inserts.
6. Fastener systems.
7. Pipe positioning systems.
8. Equipment supports.

1.02 RELATED REQUIREMENTS

A. Section 01300, Submittal Procedures

B. Section 05220, Concrete Bolts

C. Section 09900, Painting and Coating

D. Section 15051, General Piping Requirements

1.03 REFERENCES

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

ANSI B31.1 - Code for Pressure Piping, Power Piping
ANSI/MSS Standard Practice SP-58, SP-69 and SP-89 - Standard Pipe Support Components

1.04 DEFINITIONS

A. Retain abbreviation and terms that remain after this Section has been edited.

B. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

C. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.05 SUBMITTALS

A. All submittals shall be submitted in accordance with Section 01300.

B. Include design submittals signed by a qualified professional engineer, shop drawings for all pipe supports and hangers including fabrication and installation details, manufacturer's printed data, welding certificates, and similar relevant information.

C. All pipe supports and hangers shall be submitted for review prior to installation.

D. In addition, the following piping items shall be submitted:

1. Any major relocation of piping from what is shown on the Drawings.
2. Any change of materials, jointing methods, or supports from what is shown on the Drawings or what is specified these Technical Specifications.

1.06 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.2, "Structural Welding Code--Aluminum."
3. AWS D1.3, "Structural Welding Code--Sheet Steel."
4. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
5. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Products listed in this Section refer to products manufactured by Grinnell. Equivalent units manufactured by Tolco - Division of Cooper Industries, or approved equal, may be substituted.

1. Any reference to a specific figure number of a specific manufacturer is for the purpose of establishing a type and quality of product.
2. Any item comparable in type, style, materials, quality and performance shall be considered as equal.

2.02 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Coordinate first paragraph and list below with Part 2 "Manufacturers" Article. Retain "Available" for nonproprietary and delete for semiproprietary specifications.

C. Manufacturers:

1. AAA Technology & Specialties Co., Inc.
2. Bergen-Power Pipe Supports.

3. B-Line Systems, Inc.; a division of Cooper Industries.
4. Carpenter & Paterson, Inc.
5. Empire Industries, Inc.
6. ERICO/Michigan Hanger Co.
7. Globe Pipe Hanger Products, Inc.
8. Grinnell Corp.
9. GS Metals Corp.
10. National Pipe Hanger Corporation.
11. PHD Manufacturing, Inc.
12. PHS Industries, Inc.
13. Piping Technology & Products, Inc.
14. Tolco Inc.

D. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

E. Nonmetallic Coatings: Plastic coating, jacket, or liner.

F. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.03 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.04 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Coordinate first paragraph and list below with Part 2 "Manufacturers" Article. Retain "Available" for nonproprietary and delete for semiproprietary specifications.

C. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. GS Metals Corp.
4. Power-Strut Div.; Tyco International, Ltd.
5. Thomas & Betts Corporation.
6. Tolco Inc.
7. Unistrut Corp.; Tyco International, Ltd.

D. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

E. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.05 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Manufacturers:

1. Carpenter & Paterson, Inc.
2. ERICO/Michigan Hanger Co.
3. PHS Industries, Inc.
4. Pipe Shields, Inc.
5. Rilco Manufacturing Company, Inc.
6. Value Engineered Products, Inc.

C. Insulation-Insert Material for Cold Piping: [Water-repellent treated, ASTM C 533, Type I calcium silicate] [Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass] [ASTM C 552, Type II cellular glass with vapor barrier].

D. Insulation-Insert Material for Hot Piping: [Water-repellent treated, ASTM C 533, Type I calcium silicate] [Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass] [ASTM C 552, Type II cellular glass].

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.06 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Manufacturers:

1. Hilti, Inc.
2. ITW Ramset/Red Head.
3. Masterset Fastening Systems, Inc.
4. MKT Fastening, LLC.
5. Powers Fasteners.

C. Mechanical-Expansion Anchors: Insert-wedge-type stainless steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

D. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. Empire Industries, Inc.
3. Hilti, Inc.
4. ITW Ramset/Red Head.
5. MKT Fastening, LLC.
6. Powers Fasteners.

2.07 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, system of metal brackets, clips, and straps for positioning piping in pipe spaces for plumbing fixtures for commercial applications.

B. Manufacturers:

1. C & S Mfg. Corp.
2. HOLDRITE Corp.; Hubbard Enterprises.
3. Samco Stamping, Inc.

2.08 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.09 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

2.10 DESIGN REQUIREMENTS

A. Contractor is responsible for design, sizing, spacing, locating, and furnishing supports for all above grade piping/ducting, whether or not the supports are shown on the Drawings. Piping shall be rigidly anchored to walls and ceilings by means of suitable pipe hangers or wall brackets.

1. Supports, anchor bolts, and bolt embedment shall be of sufficient design and spacing to withstand all static, dynamic, and seismic loads, with safety factor of 3.
2. All pipes/ducts, whether horizontal, or vertical, shall be supported to prevent lateral sway and visible deflection.
3. All pipe hangers and supports shall be designed for seismic Zone 4 forces in accordance with UBC.

4. All pipe and appurtenances connected to equipment shall be supported in such a manner as to prevent undue strain being imposed on the equipment, valves or fittings.

5. Hangers and supports shall be spaced in accordance with ANSI B31.1, unless noted otherwise on the Drawings, or specified herein.

6. Metal piping shall be supported at intervals of not more than ten feet with a minimum of one support per pipe section at pipe fittings, valves and flowmeters. There shall be no noticeable sagging of piping between supports.

7. Pipe supports shall not result in point loadings but shall distribute pipe loads evenly along the pipe circumference.

8. All miscellaneous piping, including valves and devices therein, shall be supported approximately 1-1/2 inches from walls and ceilings on suitable brackets.

9. If vibration is encountered after the piping system is in operation, appropriate vibration control equipment will be installed at the direction of the Agency at no additional cost to the Agency.

B. Design Requirements:

1. 316 stainless steel bolts in concrete adhesive anchors shall be used unless noted otherwise on the Drawings.

2. For exposed, non-submerged conditions, hot-dipped galvanized steel, 15 oz/sq. ft, shall be used.

3. Contact between dissimilar metals shall be prevented by the use of copper plated, rubber, vinyl coated, or stainless steel hangers or supports.

4. Pipe support saddles, Grinnell Figure 264, or equal.

5. Unless otherwise shown or specified, hangers shall be of adjustable split-ring swivel type, Grinnell Figure 104, or equal. Strap hangers are not acceptable.

6. All supports and hangers shall be capable of adjustment after placement of piping.

7. Supports and hangers shall be designed to allow for proper pitch of pipes.

8. Supports and hangers shall be provided at changes in direction.

9. Supports and hangers shall be capable of supporting the pipe for all service and testing conditions.

10. Supports and hangers shall allow free expansion and contraction of the piping throughout the full operating temperature range to prevent excessive stress.

11. No piping shall be supported from other piping or from metal stairs, ladders, and walkways, unless specifically directed or authorized by the Agency.

12. Pump housings shall not be utilized to support connecting pipes.

13. Pipe supports shall not be placed under equipment where such support could damage equipment or void equipment warranty, such as under the body of a magnetic flow meter.

14. All vertical pipes shall be supported at intervals not to exceed ten feet by approved pipe collars, clamps, brackets, or wall rests, and at all points necessary to insure rigid construction.

15. Epoxy adhesive anchor bolts shall be per Section 05220, “Concrete Bolts”.

16. Support spacing for metallic piping 2-inch diameter and smaller and copper tubing shall not exceed five feet unless shown otherwise on the Drawings.

17. All uninsulated PVC or fiberglass piping shall be protected from local stress concentrations at each support point.

    a. Protection shall be provided by 316 stainless steel protection shields or other method as approved by the Agency.

    b. Where pipes are bottom supported, 180 degrees arc shields shall be furnished. Where 360 degrees of support is required, such as at U bolts, protection shields shall be provided for the entire pipe circumference.

    c. Protection shields shall have an 18-gauge minimum thickness, not be less than 12 inches in length and be securely fastened to the pipe with 316 stainless steel metal straps not less than 1/2 inch wide.

18. Contractor shall provide suitable method of support for pipes connecting to plastic storage tanks. Where supports connect directly to tank, Contractor shall ensure that tanks are supplied with molded lugs or connection points, where required.

19. Where pipe supports and hangers come in contact with copper piping, provide protection from galvanic corrosion by wrapping pipe with 1/16-inch thick neoprene sheet material and galvanized protection shield or provide copper plated or PVC coated hangers and supports.

20. Any required pipe supports for which the supports specified in this Section are not applicable shall be fabricated or constructed, as part of the work of this Section, from standard structural steel shapes, concrete, and anchor hardware similar to items previously specified herein and shall be subject to the approval of the Agency.

21. Individually supported small diameter PVC or plastic piping shall be supported as recommended by the manufacturer except that support-spacing shall not exceed three feet.

22. Supports for multiple small diameter PVC or plastic piping shall be continuous wherever possible.

23. Multiple, suspended, horizontal PVC or plastic pipe runs, where possible, shall be supported by ladder type cable trays such as the Electray Ladder by MP Husky or equal.

    a. Ladder type cable trays shall be furnished complete with all hanger rods, rod couplings, concrete inserts, hanger clips, etc., required for a complete support system.

    b. The cable trays shall provide continuous support along the length of the pipe.

PART 3 - EXECUTION

3.01 GENERAL

A. Piping and pipe supports shall be located so as to not interfere with open accesses, walkways, platforms, and with maintenance or disassembly of equipment.

B. Field painting shall be in accordance with Section 09900, “Painting and Coating”.

C. Finished iron or steel surfaces not galvanized or painted shall be properly protected to prevent rust and corrosion.

3.02 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F pipes, NPS 4 to NPS 16, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24, if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
6. Adjustable Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS 3/4 to NPS 8.
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
9. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2.
10. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8.
11. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange.

15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.

16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36, if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.

17. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30, from 2 rods if longitudinal movement caused by expansion and contraction might occur.

18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to NPS 20, from single rod if horizontal movement caused by expansion and contraction might occur.

19. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes, NPS 2 to NPS 24, if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.

21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, NPS 2 to NPS 30, if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.

2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.

2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.

3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.

4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.

5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.

2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.

3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.

4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.

5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.

6. C-Clamps (MSS Type 23): For structural shapes.

7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.

8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.

9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.

10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.

11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.

12. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.

    b. Medium (MSS Type 32): 1500 lb.

    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.

14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.

2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.

3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.

2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.

3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.

4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.

5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.

6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.

7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from trapeze support.

8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

   a. Horizontal (MSS Type 54): Mounted horizontally.

   b. Vertical (MSS Type 55): Mounted vertically.

   c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

N. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

O. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

3.03 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Each trapeze pipe hanger in first paragraph and subparagraphs below requires calculation and detail.

C. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.

2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

D. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

E. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

F. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.

2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

G. Pipe Positioning System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

H. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

I. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

J. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

K. Install lateral bracing with pipe hangers and supports to prevent swaying.

L. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

M. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

O. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.

   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.

   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.

   c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
4. Shield Dimensions for Pipe: Not less than the following:
    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    b. NPS 4: 12 inches long and 0.06 inch thick.
    c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
    d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
    e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
5. Pipes NPS 8 and Larger: Include wood inserts.
6. Insert Material: Length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.04 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.05 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.06 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

END OF SECTION

SECTION 15100

MANUAL, CHECK, AND PROCESS VALVES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Manual, check, and process valves and operators.

1.02 RELATED REQUIREMENTS

A. Section 01300, Submittal Procedures

B. Section 09900, Painting and Coating

C. Section 15051, General Piping Requirements

D. Section 15052, Pressure Testing of Piping

E. Section 15054, Disinfection of Piping

F. Section 15165, Mechanical Pipe Couplings.

1.03 REFERENCES

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings

AWWA C105 - Polyethylene Encasement for Ductile Iron Pipe Systems

AWWA C110 - Ductile Iron and Gray Iron Fittings

AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast

AWWA C210 - Liquid-Epoxy Coatings and Linings for Steel Water Pipe and Fittings

AWWA C213 - Fusion-Bonded Epoxy Coatings and Linings For Steel Water Pipe and Fittings

AWWA C500 - Metal-Seated Gate Valves for Water Supply Service

AWWA C504 - Rubber-Seated Butterfly Valves

AWWA C507 - Ball Valves 6−inch through 60−inch

AWWA C508 - Swing-Check Valves for Waterworks Service 2-in Through 24-in NPS

AWWA C509 - Resilient−Seated Gate Valves Water Supply Service

AWWA C515 - Reduced-Wall, Resilient Seated Gate Valves for Water Supply Service

AWWA C517 - Resilient-Seated Cast Iron Eccentric Plug Valves

AWWA C518 - Dual-Disk Swing Check Valves for Waterworks Service

AWWA C519 - High Performance Waterworks Butterfly Valves – 3 In. Through 60 In.

AWWA C521 - Plastic Ball Valves

AWWA C541 - Hydraulic and Pneumatic Cylinder and Vane-Type Actuators for Valves and Slide Gates

AWWA C542 - Electric Motor Actuators for Valves and Slide Gates

AWWA C550 - Protective Interior Coatings for Valves and Hydrants

AWWA C606 - Grooved and Shouldered Joints

AWWA C800 - Underground Service Line Valves and Fittings

ASTM A126 - Standard Specification for Gray iron Castings for Valves, Flanges and Pipe Fittings

ASTM A536 - Standard Specification for Ductile Iron Castings

ANSI B2.1 - American National Standard Taper Pipe Threads

ANSI B16.1 - Gray Iron Pipe Flanges and Flanged Fittings, Classes 25, 125 and 250

ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings

ASTM D2000 - Standard Classification System for Rubber Products in Automotive Applications

SSPC - Steel Structures Painting Council

National Sanitation Foundation (NSF)

Standard No. 14 - Plastic Piping Components and Related Materials
Standard No. 61 - Drinking Water System Components - Health Effects

1.04 SUBMITTALS

A. All submittals shall be submitted in accordance with Section 01300, “Submittal Procedures”.

B. Where appropriate include manufactures’ printed data, shop drawings, samples, certificates, design submittals, test reports, quality control at source or in field, special procedures and special qualifications.

C. In addition, the following valves and appurtenances items shall be submitted:

1. Any major relocation of valves or appurtenances from what is shown on the Drawings.
2. Any change of materials, jointing methods, or supports from what is shown on the Drawings or what is specified these Technical Specifications.

D. The submittal for each type of valve shall include:

1. Tag numbers for all valves included in the submittal.
2. Name and contact information of the manufacturer and supplier.
3. Descriptive literature, bulletins, and/or catalogs of the equipment.
4. Complete bill of materials and recommended spare parts.
5. The total weight of the valve when installed.
6. Manufacturer’s installation instructions.
7. Special tools to be supplied with the valve.
8. List in detail the operation and maintenance information that will be provided.
    a. Include the on-site services of a trained manufacturer’s service representative.

E. The manufacturer of each shipment of valves shall be required to supply a statement certifying that each lot or load of valves has been subjected to and meets the tests specified for those items required in the applicable AWWA, ASTM and ANSI references.

F. The Contractor shall provide the following:

1. Shop drawings, including details of construction, dimensions, and actuator positioning.

2. Independent supports for the valves and appurtenances.

1.05 PIPE SCHEDULE

A. Refer to the Drawings for the Pipe Schedule.

1.06 VALVE SCHEDULE

A. Contractor is responsible for the Schedule of valves per Section 01301.

1. The valve schedule includes tag number, location, valve type, operator, valve size and valve material, comments on installation, service and pressure ratings.

1.07 QUALITY CONTROL

A. The manufacturer of the valves and appurtenances shall have 10 years' experience in the manufacture of the valves and appurtenances they intend to supply.

1. The manufacturer must be well established, reputable, and qualified in the opinion of the Agency.

2. The Agency may choose to limit the manufacturers permitted to supply particular valves and appurtenances to one or more manufacturers due to the Agency's operation and maintenance concerns.

B. All valves and appurtenances of the same type shall be the product of one manufacturer.

C. All valves and appurtenances shall be new and of current manufacture.

D. All valves and appurtenances shall conform with the service and pressure ratings listed in the Valve Schedule.

1. When not listed, the Contractor shall ascertain appropriate information.

E. All coatings and lubricants in contact with potable water shall be NSF 61 certified.

1.08 WARRANTY

A. Each supplier shall warranty their materials and workmanship for a period of 24 months (from acceptance by Agency) against material and fabrication defects.

B. During the warranty period, the Contractor shall provide the services of a trained manufacturer's representative to make necessary adjustments, repairs and replacements of defective materials, valves or appurtenances to maintain the original functioning of the valves at no cost to the Agency.

1.09 OPERATION AND MAINTENANCE INFORMATION

A. Operation and maintenance manuals, spare parts and instructions of Agency personnel are required for all valves and appurtenances.

1. The Contractor's submittal for each valve or appurtenance shall list in detail the operation and maintenance information that the Contractor will provide.

2. The Contractor's submittal for each valve or appurtenance shall list in detail the instructions of Agency personnel by the on-site services of a trained manufacturer's service representative.

B. Special tools, if required for normal operation and maintenance, shall be supplied with the valves and appurtenances.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Valves shall be the same size as the line in which they are installed unless otherwise noted on the Drawings.

B. Valve ends shall be compatible with the piping system in which they are being installed in accordance with the Drawings or directed by the Agency.

C. Unless otherwise noted, all valve operators shall be installed on the valves they serve at the valve factory.

D. All items (including valve interiors) shall be cleaned prior to installation, testing, and final acceptance.

E. Bolts and Nuts.

1. Refer to the Pipe Schedule on the Drawings for the bolt and nut material to be used on pipes where valves and appurtenances are to be installed.

2. Refer to Section 15051, "General Piping Requirements" for requirements.

F. Gaskets.

1. Mechanical-joint rubber gasket configuration and materials shall comply with AWWA C111 and shall be in accordance with the applicable joint type and pressure rating of the piping system.

2. Flange gaskets shall be 1/8-inch thick aramid fiber bound with nitrile for all sizes of pipe.

   a. Gaskets shall be full-face type with pre-punched holes or ring-type extending to the inner edge of the bolt circumference of the flange.

   b. Ring-type gaskets may only be used as directed by the Agency.

3. If soil contaminated with organic solvents or petroleum products is encountered during the course of the work, alternate gasket materials or joint treatment may be required by the Agency.

2.02 RESILIENT WEDGE GATE VALVES

A. Valves shall be ductile-iron in accordance with AWWA C509 and C515 except as modified herein.

B. Service is potable water.

1. All coatings and lubricants in contact with potable water shall be NSF 61 certified.

C. Connections as indicated on the Drawings.

1. Mechanical joint shall comply with AWWA C111.
2. Flanged shall comply with ANSI B16.1, Class 125 flange drilling.

D. Valves shall have smooth unobstructed waterways free from any sediment pockets.

E. Valves shall be leak-tight at their rated pressure.

1. Valves 4” through 12” shall have a pressure rating of 250 psi. unless otherwise shown on the Drawings.
2. Valves 14” through 24” shall have a pressure rating of 200 psi. unless otherwise shown on the Drawings.

F. Valves shall have a non-rising low-zinc bronze or stainless steel stem, opened by turning left (counterclockwise).

1. Handwheels shall have an arrow and the word OPEN cast thereon to indicate the direction of opening.

G. Stem seals shall be the O-ring type incorporating a minimum of two rings as required by AWWA C509.

H. Low-friction torque-reduction thrust washers or bearings shall be provided on the stem collar.

I. Wedge (gate) shall be fully encapsulated with a bonded-in-place Ethylene Propylene Diene Monomer (EPDM) elastomeric covering.

1. Minimum thickness of the rubber seating area shall be ¼".

J. Valve operators.

1. For buried applications shall be provided with a 2" square operating nut.
2. Valves located above ground or in structures shall be equipped with a minimum 12” diameter hand wheel in accordance with AWWA C509 unless otherwise indicated on the Drawings or required by the Agency.

K. The valve interior surfaces (except for the encapsulated disc) shall be epoxy coated.

1. Epoxy lining of valve surfaces shall be performed by the valve manufacturer.
2. Surface preparation shall be as detailed in SSPC-SP10, Near White Blast Cleaning.
3. The minimum dry film thickness for epoxy linings shall be 8 mils.
    a. Powder epoxy lining and coating materials shall contain 100% solids in accordance with AWWA C213, shall be applied in one or more coats, and shall conform to the coating manufacturer’s recommendations.

b. Liquid epoxy lining shall be applied in two (2) coats in accordance with AWWA C210.

L. Valve exterior surfaces shall be coated per Section 09900, “Painting and Coating”.

M. All bolts and nuts used in the construction of these valves shall be Type 316 stainless steel.

N. Manufacturers:

1. Mueller, Kennedy Valve Co., Clow, AVK, M&H Valve Co., American Flow Control, or approved equal.

2.03 ECCENTRIC PLUG VALVES

A. Provide full (100%) ported, eccentric ¼ turn, plug valves suitable for wastewater service.

1. Valves shall be ductile-iron in accordance with AWWA C517 except as modified herein.
2. Sized 3 in. and larger.
3. Valves shall have top access cover and adjustable packing.
4. Encapsulated resilient faced plugs.

B. Size and Service as indicated in the Drawings.

C. Connections as indicated on the Drawings.

1. Flanged connections comply with ANSI B16.1, Class 125 flange drilling.
2. Mechanical joint connections comply with AWWA C111.

D. Pressure Rating.

1. 3” to 12”, 175 psi. unless otherwise shown on the Drawings.
2. 14” to 72”, 150 psi. unless otherwise shown on the Drawings.

E. Materials of Construction:

1. Body and cover: Cast iron per ASTM A126, Class B.
   a. For pressures up to 250 psi cast iron per ASTM A536, Grade 65-45-12.
2. Plug and integral shaft
   a. Ductile iron per ASTM A536, Grade 65-45-12.
   b. Buna-N encapsulated per ASTM D2000.
3. Radial shaft bearings: Type 316 stainless steel, self-lubricating.
4. Adjustable packing: Acrylonitrile-Butadiene (NBR) multiple V-ring type, with a packing gland follower.
5. Hardware: Type 316 stainless steel.
6. Seat: Raised, welded nickel.

F. Interior surfaces: Coated with fusion-bonded epoxy.

1. 12-mil minimum thickness.

G. The valve exterior surfaces for above ground shall be coated per Section 09900, “Painting and Coating”.

H. For below ground service the valve exterior shall be epoxy coated per manufacturer’s standard when directed by the Agency.

I. Valve actuation as indicated in the Drawings.

J. Manufacturers:

1. DeZurik only.

2.04 CHECK VALVES

A. Swing check valves, 3 inches and larger, for water, sewage, and general service shall be of the outside lever and spring or weight type in accordance with AWWA C508 unless otherwise indicated.

1. The valve shall be furnished with an air cushion system to cushion valve closure and minimize slamming.

2. For potable water service all coatings and lubricants in contact with potable water shall be NSF 61 certified.

B. Size and Service as indicated in the Drawings.

C. Connections as indicated on the Drawings.

1. Mechanical joint shall comply with AWWA C111.

2. Flanged shall comply with ANSI B16.1, Class 125 flange drilling.

D. Valves shall have full-opening passages.

1. The pivot point of the disc shall be outside the port opening, allowing the entire disc to lift clear of the flow area.

E. The air cushion shall be a side mounted cylinder with an adjustable control check valve.

F. Units shall have a flanged cover piece to provide access to the disk.

G. Unless otherwise indicated, swing check valves shall be provided with position indicators.

H. Valves shall be leak-tight at their rated pressure.

1. The minimum water working pressure shall be 150 psi unless otherwise shown on the Drawings.

I. Materials of Construction:

1. Body and cover: Cast iron per ASTM A126, Class B.

2. Body seat: Type 316 stainless steel with an O-ring seal secured with stainless steel screws.

3. Disc and disc arm: Ductile iron per ASTM A536.

4. Disc seat: Precision molded Buna-N (NBR) per ASTM D2000.

5. Interior surfaces: Coated with fusion-bonded epoxy.

6. Hardware and bolts: Type 316 stainless steel.

J. The valve exterior surfaces shall be coated per Section 09900, “Painting and Coating”.

K. Manufacturers:

1. APCO CVS Series 6000 or approved equal.

2.05 RUBBER-FLAPPER SWING CHECK VALVE

A. Rubber-flapper swing check valves shall have a heavily constructed ductile-iron body and cover.

1. The body shall be long pattern design (not wafer), with integrally cast-on end flanges.

2. The flapper shall be Acrylonitrile-Butadiene, having an "O" ring seating edge and be internally reinforced with steel.

B. Size and service as indicated in the Drawings.

C. For service refer to Valve Schedule.

D. Flapper shall be captured between the body and the body cover in a manner to permit the flapper to flex from closed to full open position during flow through the valve.

1. Flapper shall be easily removed without need to remove valve from line.

2. The check valves shall have full pipe size flow area.

3. Seating surface shall be on a 45° angle requiring the flapper to travel only 35° from closed to full open position, for minimum head loss and non-slam closure.

E. The flapper shall be coated on both side with a high-strength Acrylonitrile-Butadiene fabric.

1. This creates an elastic spring effect, molded internally, to assist the flapper to close against a slight head to prevent slamming.

2. When essential to create backflow through the check valve, as directed by the Agency, an external backflow device shall be furnished.

F. Valve ends shall be flanged ductile iron in accordance with Section 15061 unless otherwise called for on the Drawings or directed by the Agency.

G. Check valves shall be tested by the manufacturer and the test results shall be approved by the Agency prior to shipment to the project.

1. Check valves must unseat at a head no greater than 24 inches.

H. Manufacturers:

1. APCO or approved equal.

2.06 ELASTOMERIC “DUCKBILL STYLE” CHECK VALVES

A. Check Valves are to be all rubber and of the flow operated check type with a flanged end connection.

1. The port area shall contour down to a duckbill which shall allow passage of flow in one direction while preventing reverse flow.

2. The flange and flexible duckbill sleeve shall be one-piece rubber construction with nylon reinforcement.

3. The bill portion shall be thinner and more flexible than the valve body and formed into a curve of 180°.

4. The flange drilling shall conform to ANSI B16.1 Class 125.

5. The valve shall be furnished with stainless steel back-up rings for installation.

B. Size and service as indicated in the Drawings.

C. Manufacturer must have available flow test data from an accredited hydraulics laboratory to confirm pressure drop data.

1. Manufacturer's name, plant location, valve size and serial number shall be bonded to the check valve.

2. Calculations shall be submitted showing minimum headloss through the check valve at design flow with less than 6-inches of surcharging in the upstream sewer line.

D. Function:

1. When line pressure inside the valve exceeds the backpressure outside the valve, the line pressure forces the bill of the valve open, allowing flow to pass.

2. When backpressure exceeds the line pressure, the bill of the valve is forced closed.

E. Manufacturers:

1. Series 35 as manufactured by Tideflex Technologies, Carnegie, PA 15106 or approved equal.

2.07 BALL VALVES - (2 INCHES AND SMALLER)

A. Ball valves 2 inches and smaller shall be of bronze construction conforming to ASTM B62.

1. Equip with a T-Head or lever handle operator as required.

2. Valve ends shall be compatible with the piping system in which they are being installed or as indicated on the Drawings or Standard Drawings.

3. Ball valves shall be rated for a minimum pressure of 200 psi unless otherwise shown on the Drawings or these Technical Specifications.

B. Size and service as indicated in the Drawings.

C. Manufacturers:

1. Cambridge, Ford, Jones, Mueller, or approved equal.

2.08 SMALL DIAMETER ISOLATING VALVES

A. Provide all small diameter valves and cocks for shut-off process connections, instrumentation and other miscellaneous uses in accordance with the Drawings or these Technical Specifications.

1. These valves shall be of the same material and pressure rating as the adjacent process piping.

2. Shutoff valves shall be compatible with instrumentation and other equipment in accordance with the manufacturer's recommendations.

2.09 VALVE BOXES AND EXTENSION STEMS

A. Provide a valve box for each buried valve consisting of a frame, cover, and one-piece extension pipe.

1. Construct frame and cover of cast iron and design for traffic loading.
2. Covers of valve boxes shall be permanently labeled as requested by the Agency.

B. Where floor boxes are indicated for operating nuts in or below concrete slabs, they shall be hot-dipped galvanized cast-iron or steel and sized to fit the slab thickness. For operating nuts in the concrete slab, the cover shall be bronze-bushed.

C. Unless otherwise indicated, all buried valves shall have extension stems to grade with wrench nuts located within 6 inches of the valve box cover. Where a valve is submerged, provide extension stem to bring the operating nut to 6 inches above the water surface.

1. Extension stems shall be solid core steel for buried service and Type 316 stainless steel for submerged service.
2. Wrench nuts shall comply with AWWA C500.
3. The connection of the extension stem to the operating nut and to the valve shall withstand a pull of 300 foot-pounds without damage.
4. Furnish a minimum of two operating keys, or one key per 10 valves, whichever is greater.

2.10 FLOOR STANDS AND EXTENSION STEM SUPPORT BRACKETS

A. Where required, provide floor stands and extension stems for operation of valves. Floor stands shall be of the nonrising stem, indicating type, with steel extension stems, couplings, handwheels, stem guide brackets, and special yoke attachments as required by the valves and recommended and supplied by the stand manufacturer.

1. Floor stands shall be cast-iron base type: Clow, Figure F-5515; Bingham and Taylor; Stockham; or equal.
2. Handwheels shall turn counterclockwise to open the valves.

B. Where required, provide adjustable stem guide brackets for extension stems.

1. The bracket shall allow valve stems to be set over a range of 2 to 36 inches from walls.
2. Provide bushings drilled to accept up to 2-inch-diameter stems. Base, arm, and clamp shall be Type 316 stainless steel. Bushing shall be bronze (ASTM B584, Alloy C86400 or C83600). Bolts, nuts, screws, and washers (including wall anchor bolts) shall be Type 316 stainless steel.
3. Provide slots in the bracket to accept 3/4-inch bolts for mounting the bracket to the wall.
4. Products: Trumbull Industries, Inc., Adjustable Stem Guide or equal.

2.11 MANUAL OPERATORS

A. Unless otherwise indicated, all valves shall be furnished with manual operators.

1. Provide lever or wrench actuators for exposed valves 6 inches and smaller. For larger valves, provide handwheels.
2. Where manually operated valves (size 4 inches and larger) are installed with their centerlines more than 6 feet 9 inches above the floor, provide chainwheel and guide actuators.
3. Provide enclosed gear actuators on butterfly, ball, and plug valves 6 inches and larger.
    a. Gear actuators for valves 6 through 20 inches shall be of the worm and gear or of the traveling nut type.
    b. Gear actuators for valves 24 inches and larger shall be of the worm and gear type.
4. Provide gear actuators on gate valve 14 inches and larger.
    a. Gear actuators shall be of the bevel or spur gear type.
    b. Provide grease case.
    c. Gearing shall comply with AWWA C500.
5. Gear actuators shall be enclosed, oil lubricated, with seals provided on shafts to prevent entry of dirt and water into the actuator.
6. Actuators for valves in exposed service shall contain a dial indicating the position of the valve disc or plug.

PART 3 - EXECUTION

3.01 GENERAL

A. Valves and appurtenances shall be installed in accordance with the manufacturer's recommendations and as shown on the Drawings.
    1. The Contractor shall provide the services of a trained manufacturer's representative to make all necessary adjustments, repairs or replacements of valves or appurtenances.

B. Handling and cleaning.
    1. Valves shall be delivered and stored in accordance with the manufacturer's recommendations.
    2. Valves shall remain in factory packaging until ready for installation.
    3. Refer to Section 15051, "General Piping Requirements" for requirements.

C. Supports
    1. All valves and appurtenances require support to prevent their weight from being carried by the adjacent pipe.
        a. Refer to Section 15090, "Pipe Hangers and Supports" for requirements.
        b. Support may also be provided by concrete support blocks at locations approved by the Agency.

D. Corrosion protection.
    1. Refer to the Drawings for the use of corrosion control materials and equipment.

E. Gate wells and extension stems.

1. Valve boxes, floor boxes and extension stems shall be installed in accordance with the Drawings and Standard Drawings.

F. Identification of valves and appurtenances.

1. Each valve is assigned a tag number on the valve schedule.

   a. The Contractor shall submit to the Agency for review a complete listing of the label titles and label color schemes for all tag numbers.

   b. The Contractor shall permanently affix the tag number on or near the valve.

2. Refer to Section 15051, “General Piping Requirements” for requirements.

G. Painting and Coating.

1. The exterior of valves installed above ground or exposed in vaults or enclosures shall be field painted the same as the adjacent piping unless manufacturer’s instructions state otherwise.

   a. If the adjacent piping is not coated, then coat valves per applicable requirements of Section 09900, “Painting and Coating” for the exposure condition.

   b. Coat handwheels and floor stands the same as the valves.

   c. Valves shall be shipped from the factory with manufacturer’s standard exterior coating if the coating is compatible with the selected field coating topcoat.

      1. If the standard coating is not compatible with the selected topcoat, then valve shall be shipped with a compatible primer.

      2. All field cuts and damages to the coating shall be repaired in conformance with recommendations of the coating system manufacturer.

      3. All foreign matter shall be removed by wire brush or sandpaper prior to the application of the selected coating system.

2. Valves for recycled water shall be identified with a purple colored coating unless otherwise directed by the Agency.

3. Refer to Section 09900, “Painting and Coating” for requirements.

H. Petrolatum wax tape coating

1. Refer to the Valve Schedule on the Drawings for use of petrolatum wax tape coating.

2. All buried ferrous valves shall be wax tape coated in the field.

3. Refer to Section 09905, “Petrolatum Wax Tape Coating” for requirements.

I. Polyethylene encasement.

1. Refer to the Valve Schedule on the Drawings for use of polyethylene encasement.

2. All buried ferrous valves shall be installed with double wrapped polyethylene encasement.

3. Refer to Section 15051, “General Piping Requirements” for requirements

J. Pressure testing of valves and appurtenances.

1. Refer to Section 15052, “Pressure Testing of Piping” for requirements.

K. Disinfection of valves and appurtenances.

1. Refer to Section 15054, “Disinfection of Piping” for requirements.

END OF SECTION

SECTION 15165

MECHANICAL PIPE COUPLINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Sleeve type couplings

B. Flanged coupling adapters

C. Flange adapters

D. Flexible PVC couplings

E. Rubber arch expansion couplings

F. Grooved end mechanical couplings

G. Tapping saddles

H. Tapping sleeves

1.02 RELATED REQUIREMENTS

A. Section 15051, General Piping Requirements

1.03 SUBMITTALS

A. Information to be furnished shall include product data and material information showing conformance with the Drawings and these Specifications.

B. Contractor shall submit grooved connector gasket selection for all pipes specified to use grooved connectors. Selection shall be based on pipe's service condition and gasket shall be suitable for that condition.

C. The Manufacturers shall, upon request, furnish references for a minimum of five (5) existing installations of couplings of similar size or larger which have all been in continuous service for a minimum of three (3) years within the United States of America.

1.04 QUALITY ASSURANCE

A. Mechanical pipe couplings furnished under this section shall be suitable for the service conditions described in the Piping Schedule.

B. All mechanical pipe couplings shall be of new and current manufacture. The equipment Manufacturer shall be the primary source of information on all material that they furnish for the job.

C. Contractor shall be responsible for ensuring that all mechanical pipe couplings that he installs, whether specified herein or not, are suitable for the intended application.

D. All similar pipe couplings shall be supplied by a single manufacturer. The Manufacturer shall ensure the correct fit and compatibility of all components.

PART 2 - PRODUCTS

2.01 SLEEVE TYPE

A. Restrained sleeve type couplings:

1. Application: restraining and joining pipe
2. Manufacturers/Models: EBAA Iron 3800, Smith-Blair Type 471, Romac Alpha, or approved equal.

B. Restraining retainers for ACP:

1. Application: Restraining asbestos cement pipe joint
2. Manufacturers/Models: JCM 630, or approved equal.

C. Unrestrained sleeve type couplings:

1. Applications: joining pipe with same outside diameters
2. Manufacturers/Models: Smith-Blair Type 411, Dresser Style 38, Romac Style 501, Romac Macro HP, or approved equal.

D. Unrestrained transition sleeve type couplings:

1. Application: joining pipe with different outside diameters, such as steel pipe to ductile iron pipe
2. Manufacturer/Models: Smith-Blair Type 413, Dresser Style 62, Romac 501, Romac Macro HP, or approved equal.

E. Insulating sleeve type couplings

1. Application: joining different metallic pipe materials,
2. Manufacturers/Models: Romac Style IC501 or IC400, Romac Macro HP, Smith-Blair 416 or approved equal.

F. Coating: provide fusion bonded epoxy coating per AWWA C213 if not made of stainless steel.

G. Pressure rating: 150 psi

H. Hardware: 316 stainless steel

I. Gaskets: suitable wastewater exposure

2.02 FLANGED COUPLING ADAPTERS

A. Restrained Flange Coupling Adapters:

1. Application: joining plain end pipes to flanged pipe, valves, or fittings

2. Manufacturers/Models: Smith-Blair Type 913, Romac FCA501 or FC400, or approved equal.

3. Bolt patterns: ANSI 125 or 150 drilling.

B. Restrained flanged coupling adapters:

1. Application: joining and restraining plain end pipes to flanged pipe, valves, or fittings

2. Manufacturers/Models: Smith-Blair Type 911, Romac Industries RFCA, Romac FC, EBAA Iron Series 2100 Megaflange, or Owner approved equal.

C. Coating: provide fusion bonded epoxy coating per AWWA C213 if not made of stainless steel.

D. Pressure rating: 150 psi

E. Hardware: 316 stainless steel

F. Gaskets: suitable wastewater exposure

2.03 FLANGE (RESTRAINED) ADAPTERS

A. Application: Flange adapters for use in jointing and restraining plain end ductile iron and steel pipe to flanged pipe, valves, or fittings

B. Manufacturers/Models: EBAA Iron Series 1000, Uniflange Series 400, or approved equal.

C. Bolt patterns shall be ANSI 125 or 150 drilling.

D. Pressure rating: 150 psi

E. Hardware: 316 stainless steel

F. Gaskets: suitable wastewater exposure

2.04 FLEXIBLE PVC COUPLING

A. Application: Joining FRP foul air ducting where shown on the Plans.

B. Requirements:

1. Rated for 140 degree F continuous service

2. Material: Flexible PVC 60 Duro Shore A

3. Pressure tested up to 4.3 psi

4. Integral type 316 stainless steel clamps

C. Manufacturers

1. Fernco

2. Or Equal

2.05 RUBBER ARCH EXPANSION COUPLING

A. Application: thermal expansion accommodation and vibration dampening for FRP ducting and stainless steel air piping.

B. Design: EPDM rubber wide expansion joints with integral type 316 stainless steel flanges per ANSI B16.5.

C. Service: continuous 250 degree F service, 150 psi, outdoor in direct sunlight, and 2.5-inch total axial deflection.

D. Manufacturer: General Rubber, or equal.

2.06 GROOVED MECHANICAL COUPLINGS

A. Grooved end mechanical pipe couplings for grooved ductile iron pipe shall be Victaulic style 31, or Owner approved equal.

B. Grooved end mechanical couplings shall be manufactured in two or more segments of cast ductile iron conforming to ASTM A536, Grade 65-45-12. Gaskets shall be pressure-responsive, synthetic rubber, Grade M FlushSeal, and plated steel bolts and nuts.

2.07 TAPPING SADDLE

A. Application: tapping 2-inch diameter and smaller pipe into larger pipe

B. Manufacturer: Mueller, or equal

C. Design: Double-strap type

D. Pressure rating: 200 psi

E. Straps: 316 stainless steel

F. Body: bronze or brass with iron pipe thread

G. Seal: rubber gasket or an O-ring

2.08 TAPPING SLEEVES

A. Application: tapping 4-inch diameter and larger piping into larger or equal-sized pipe

B. Manufacturer: Romac or Smith Blair

C. Design:

1. Tapping sleeves shall provide a full circumferential seal with triangular side bars.
2. Tapping sleeves shall meet MSS SP-124 and AWWA C223.

D. Size: Refer to plans

E. Service: Refer to plans

F. Pressure Rating, Class: 150 psi

G. Connection: 150 lb ANSI flange drilling

H. Installation: Contractor shall install the sleeve according to the manufacture recommendations.

I. Materials of Construction:

1. Body, Lugs, and Neck: Carbon Steel ASTM A283 Grade C
2. Flange: AWWA C207 Class D, ANSI 150 drilling
3. Studs and Nuts: Type 304 Stainless Steel. Nuts shall be coated to prevent galling.
4. Washers: One (1) 304 Stainless Steel and one (1) plastic or nylon washer per bolt.
5. Gasket: Full circumference of pipe, Buna N

J. Coating: Fusion Bonded Epoxy per AWWA C213

PART 3 - EXECUTION

3.01 EPOXY COATING AND SUPPLEMENTAL EXTERIOR COATING

A. All couplings shall be fusion bonded epoxy in accordance with NSF 61 or AWWA C213 unless constructed of 316 Stainless Steel. For buried service pipe couplings shall have a supplemental polyolefin wrap in accordance with AWWA C216 or polyethylene wrap, whichever matches the piping system.

3.02 SLEEVE TYPE COUPLINGS

A. Sleeve type couplings shall be employed where shown on the drawings, as takedown couplings on large diameter pipelines, to provide flexibility in buried piping systems at connections to structures, and as a general pipe coupling where required or permitted by the Drawings and Section 15051.

3.03 GROOVED END COUPLINGS

A. Plain or grooved end couplings shall be employed where shown on the Drawings and elsewhere at the Contractor's option after approval from the Owner’s Representative and provided that the proposed location is consistent with the restrictions set forth in these Specifications.

B. Unless specifically indicated or specified to the contrary, grooved end pipe couplings shall be of the flexible type.

C. Plain or grooved end pipe couplings shall not be employed for buried piping or piping encased in concrete or in suspended ceilings.

3.04 EXPANSION JOINTS

A. Expansion joints shall be furnished and installed, as specified, where shown in the Contract Documents, and on all air, steam, or hot water piping.

B. At least one expansion joint shall be installed on each run of air, steam, and hot water piping that exceeds 20 feet in length.

C. Expansion joints, alignment guides, and anchors shall be installed per the standards of the Expansion Joint Manufacturers Association. Expansion joints shall be installed a maximum of four pipe-diameters from an anchor. A minimum of two alignment guides shall be installed on the pipeline opposite of the anchor, the first alignment guide shall be installed 4 pipe-diameters (maximum) from the end of the expansion joint, the second alignment guide shall be installed 14 pipe-diameters (maximum) from the first alignment guide. Additional concentric guides shall be installed per the standards of the Expansion Joint Manufacturers Association.

D. Anchors shall be designed to withstand the total pressure thrust, friction force, and deflection load of the expansion joint. Materials of construction of the alignment guides and anchors shall match the piping material.

END OF SECTION

SECTION 15401

HOSES AND ACCESSORIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The Contractor shall furnish to the Agency, five (5) hoses and hose reels. Each hose shall be fifty (50) feet long. Four hoses shall be 1-inch inner diameter (I.D.) and one shall be ¾-inch and each hose shall be equipped with a female quick connect coupling at one end and a male quick connect coupling at the other end.

B. General Piping Stipulations. The General Piping Stipulations shall apply to all piping furnished under this section.

1.02 SUBMITTALS

A. All submittals shall be submitted in accordance with Section 01300, "Submittal Procedures".

B. Submit data describing hoses and accessories.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Hoses shall be all rubber, all-purpose hose. One hose shall be ¾-inch ID and four shall be 1-inch ID. Provide dual-tube hoses. Provide two-part ply of synthetic yard around the inner tube, consisting of reinforcing with a spiral winding and a sheath of mesh. Hose couplings shall be brass. Hose shall be rated for a minimum of 150 psi. Provide 5 industrial grade stainless steel spray nozzles.

B. Hose bibbs shall be constructed as shown on the Drawings.

PART 3 - EXECUTION

3.01 MOUNTING

A. Contractor to coordinate with Agency for preferred location of hose racks.

END OF SECTION

SECTION 15485

ELECTRIC WATER HEATERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following electric water heaters:

1. Thermostat-control, instantaneous electric water heaters.

1.03 SUBMITTALS

A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Source quality-control test reports.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For electric water heaters to include in emergency, operation, and maintenance manuals.

E. Warranty: Special warranty specified in this Section.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain same type of electric water heaters through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of electric water heaters and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. ASME Compliance: Where indicated, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

E. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for all components that will be in contact with potable water.

1.05 COORDINATION

A. Coordinate size and location of concrete bases with Architectural and Structural Drawings.

1.06 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Structural failures including storage tank and supports.
   b. Faulty operation of controls.
   c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Period(s): From date of Substantial Completion:

   a. Instantaneous Electric Water Heaters: One year(s).

PART 2 - PRODUCTS

2.01 INSTANTANEOUS ELECTRIC WATER HEATERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

1. Available Manufacturers:
   a. Keltech, Inc.
   b. Or Approved Equal

2. Description: Thermostat-Control, Instantaneous Electric Water Heaters: Comply with UL 499 for tankless electric (water heater) heating appliance

3. Construction: PVC piping complying with NSF 61 barrier materials for potable water, without storage capacity.

   a. Connections: NPT
   b. Pressure Rating: 150 psig (1035 kPa).
   c. Heating Element: Resistance heating system.
   d. Temperature Control: Thermostat.
   e. Safety Control: High-temperature-limit cutoff device or system.
   f. Jacket: Aluminum or steel with enameled finish or plastic.

4. Support: Bracket for floor mounting.
5. Capacity and Characteristics:

   a. Temperature Control: Adjustable thermostat.

      1) Flow Rate: 0.5 gpm (0.3 L/s) minimum for activation.
      2) Temperature Setting: 120 deg F (48.9 deg C).

   b. Electrical Characteristics:

      1) Power Demand: 54 kilowatt
      2) Volts: 480.
      3) Phases: Three.
      4) Hertz: 60.
      5) Amps per Phase: 65.

6. Accessories:

    a. Refer to plumbing construction drawings for product description and requirements

2.02 SOURCE QUALITY CONTROL

A. Prepare test reports.

PART 3 - EXECUTION

3.01 WATER HEATER INSTALLATION

A. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

3.02 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.

C. Ground equipment according to Division 16 Section "Requirements for Electrical Work."

D. Connect wiring according to Division 16 Section "600V Wires and Cables."

3.03 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

END OF SECTION

SECTION 16000
REQUIREMENTS FOR ELECTRICAL WORK

PART 1 GENERAL

1.1 DESCRIPTION

A. This section specifies electrical work including labor, electrical material, equipment, and installation and testing requirements for complete operating system. Electrical work shall also include demolition and or relocation and modifications of existing electrical equipment as shown and specified in these specifications. All equipment requiring power and or control shall include equipment furnished under this section and other sections of the specifications. The electrical drawings included in this project document are diagrammatic only and functional in nature and do not specify exact locations of equipment or equipment terminations.

1.2 QUALITY ASSURANCE

A. References: This section contains references to the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

B. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, whether or not the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
ANSI A58.1	Minimum Design Loads for Building and Other Structures
IEEE 81	Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
IEEE C57.12.01	General Requirements for Dry-Type Distribution and Power Transformers
NEMA 250	Enclosures for Electrical Equipment (1000 Volt Maximum)
NEMA ICS 1	General Standards for Industrial Controls and Systems
NEMA ICS 2	Industrial Control Devices, Controllers, and Assemblies
NEMA ICS 6	Enclosures for Industrial Controls and Systems

Reference	Title
NEMA ST20	Dry-Type Transformers for General Application
NEMA WD 1	General Requirements for Wiring Devices
NFPA 70	National Electrical Code (NEC)
CAL Title 24	California Electrical Code
CBC	California Building Code
UL 50	Enclosures for Electrical Equipment
UL 62	Flexible Cords and Cables
UL 67	Panelboards
UL 489	Molded-Case Circuit Breakers and Circuit Breaker Enclosures
UL 506	Specialty Transformers
Ul 508A	Standard for Industrial Control Panel

C. Identification of Listed Products: Electrical equipment and materials shall be listed by an independent testing laboratory for the purpose for which they are to be used. Three such organizations are Underwriters Laboratories, Inc. (UL), Canadian Standards Association (CSA), and Electrical Testing Laboratories (ETL). The independent testing laboratory shall be acceptable to the inspection authority having jurisdiction.

1.3 SUBMITTALS

A. The following specific submittal requirements for the applicable switchgear, switchboard, motors, transformers, power distribution panels and starters shall be followed:

1. Contractor shall formally place an order with equipment manufacturer within thirty days of the award of the contract. The order shall include all relevant drawings and specs including any addendum items associated with the equipment.

2. Contractor shall submit shop drawings to the City as soon as possible or within 6 weeks of the order being placed for long lead items.

3. Contractor shall forward review comments to equipment manufacturer within two days after receipt of the comments by the City.

4. Contractor shall provide the release for manufacturing to equipment manufacturer within 3 business days of receiving a favorably reviewed submittal and shall provide the City with the shipping date.

B. The following information shall be provided for all electrical equipment and materials in accordance with applicable front-end specifications:

1. Verification of fault withstands and interrupting ratings of all applicable power equipment and devices.

2. Interconnection diagrams -The Contractor shall prepare interconnection diagrams depicting all cable requirements together with their actual terminations as specified below.

   Interconnection diagrams shall be drawn to reflect actual, physical relationship between equipment and or components as shown on the drawings. The interconnection diagram shall indicate wiring between panels, terminal boxes, remotely mounted devices, and motor starters. The diagrams shall interface with the manufacturer's internal connection diagrams for panels. The diagrams shall indicate the terminations to terminal blocks of field devices at each end of the cable, the number of conductors in the cable, the size of wire, and the number of spare conductors. For each termination, the diagrams shall indicate the terminal number, wire color, and wire number as it appears on the wire marker. All terminal blocks, including spares, shall be indicated on the diagrams. Interconnection diagrams shall be provided for review and approval prior to installation of equipment.

3. Catalog-cuts including technical specifications, application information, ratings, make and model number, and other information required to verify the equipment and/or material meets the requirements of this specification.

4. A copy of this specification section with addenda updates, and all referenced sections with addenda updates, with each paragraph check marked to show specification compliance or marked to show deviations.

1.4 PROJECT/SITE CONDITIONS

A. General: Unless otherwise specified, equipment and material shall be sized and rated for an ambient temperature of 40 degrees C at an elevation ranging from sea level to 100 feet without exceeding the manufacturer's stated ratings. All outdoor locations shall be considered as corrosive areas. Enclosures for outdoors, unless otherwise noted, shall be NEMA 4X, 316 stainless steel.

B. Seismic: All electrical equipment and supports shall be braced in accordance with latest California Building Code for the site location.

C. Classified Hazardous locations: There are no classified hazardous locations in this project.

1.5 ELECTRIC SERVICE

Electric service for this pump station is existing as provided by Plant’s own power distribution in past project. Contractor shall be responsible for trenching, furnishing and installation of underground power and signal conduits, pull boxes, grounding to the new chemical area as detailed on the drawings. Coordination with the City’s staff is required.

Besides being responsible for the demolition of the existing facilities and modifications to the existing electrical systems, the Contractor shall also be responsible for coordinate with the City's staff to maintain existing pump station operations.

Refer to applicable front-end specs for general sequence of work and project constraints.

PART 2 PRODUCTS

2.1 GENERAL

Equipment and materials shall be new and free from defects. All equipment of the same or similar type shall be of the same manufacturer throughout the work. Standard production materials shall be used wherever possible.

2.2 RACEWAY, FITTINGS, AND SUPPORTS

A. General: Conduit shall be provided for power, control, instrumentation, grounding, lighting, receptacles, and signaling systems.

B. Raceway:

1. All exposed conduit, indoor and outdoor, shall be threaded, PVC-coated galvanized, rigid steel conduit. All conduit accessories such as couplings, elbows, junction boxes etc. shall also be PVC-coated galvanized steel. Minimum size of conduit shall be 3/4 inch. All conduit supports shall be 316 SS. Bushings shall be galvanized, malleable iron with insulating collars. Grounding bushings shall be locking type with a feed through compression lug. Unions shall be galvanized, ferrous alloy type. Threadless fittings are not acceptable. Running threads shall not be used in lieu of conduit nipples. Threaded hubs shall be used to terminate conduits entering boxes. PVC-coated RGS conduit shall be manufactured by Robroy Industries, Perma-Cote Industries, or equal.

2. Liquidtight, flexible steel conduit shall be formed from spirally wound, galvanized steel strip with successive convolutions securely interlocked and jacketed with liquidtight, plastic cover. Minimum size shall be 3/4 inch. Fittings for liquidtight conduit shall have cadmium-plated, malleable iron body and gland nut with cast-in lug, brass grounding ferrule threaded to engage conduit spiral and O-ring seals around the conduit and box connection and insulated throat. Forty-five and 90-degree fittings shall be used where applicable.

3. Embedded or encased underground conduit shall be Schedule 40, high impact, polyvinyl chloride (PVC). Minimum size shall be 1 inch.

4. Fittings for PVC conduit shall be solvent welded type.

C. Boxes:

1. Boxes for use outdoors and in process areas shall be hot-dip, galvanized cast ferrous alloy type FD with integrally cast-threaded hubs for conduit entry. Boxes

larger than FD boxes shall be welded steel and hot-dip galvanized after fabrication. Use PVC-coated boxes where PVC-coated RGS conduits are used.

2. Boxes installed in areas where electrical metallic tubing is specified shall be standard UL approved electrogalvanized sheet steel, 4-inch square or octagon minimum trade size. In this project EMT and related accessories are prohibited.

3. Conduit bodies shall be ferrous alloy type with screw taps for fastening covers. Gaskets shall be made of neoprene.

D. Raceway Supports: 316 Stainless steel framing channels shall be used to support groups of conduit. Individual conduit supports shall be one-hole stainless steel malleable iron pipe straps with stainless steel clamp backs and nesting backs where required. Ceiling hangers shall be adjustable, stainless steel rod hangers. Straps or plumbers tape are not acceptable. Hanger rods shall be 1/2-inch all thread stainless steel rod.

E. Concrete Pull Boxes: Provide and install pre-cast concrete pull boxes in locations indicated on the Drawings and as required by NEC. Pull boxes shall be:

1. Designed for heavy traffic conditions, with pull box and cover designed for heavy traffic bridge loading H-20

2. Dimension of the pull boxes shall be as shown and required on the drawings.

3. Provided with engraved “Electrical” or “Instrumentation” or “Signal” as applicable on the top side of the covers.

F. Ceiling or wall mounted pull boxes: These boxes shall be made of 316 stainless steel materials 10 gauge sheet metal suitable for wall or ceiling mounting. Bottom of boxes shall be hinged with latch. Boxes shall fully secured with SS supports and or straps to resist seismic activities.

2.3 CONDUCTORS, WIRE, AND CABLE

A. General: Conductors, wires, and cable shall be provided for power, control, lighting, receptacles, instrumentation, grounding and signal circuits. The quantity and size of conductors shall be as specified.

B. Power and Control Conductors: Power conductors shall be copper single conductor, stranded, annealed copper with 600-volt type XHHW-2 cross-linked polyethylene insulation. Control conductors shall be copper single conductor multi conductor 600 volt type XHHW-2. The conductor shall be manufactured by Okonite, Okoseal-N; CABLEC; or equal.

C. Lighting and Receptacle Circuit Conductors: Conductors for lighting and receptacle circuits shall be single conductor, annealed copper with 600-volt THWN/THHN PVC insulation. Conductor sizes No. 10 AWG and larger shall be stranded. No. 12 AWG shall be solid conductor. Minimum conductor size shall be No. 12 AWG. Conductors shall be Okonite, Okoseal-N; CABLEC; or equal.

D. Grounding Conductors: Grounding conductors shall be as specified in 16000-2.7 A.

E. Instrumentation and Signal Cable: Cable for instrumentation and signal circuit shall be twisted shielded pair or triad as specified, No. 16 AWG 7-strand copper with 600-volt PVC insulation, 100 percent aluminum-Mylar tape shield, No. 18 AWG tinned copper drain wire and overall PVC jacket, Okonite, Okoseal-N type P-OS, CABLEC, or equal.

F. Splicing and Terminating Materials:

1. Connectors: Connectors for stranded conductors shall be tool applied tin-plated copper, compression type of the correct size and UL approved for the application.

   Connectors for wire sizes No. 10 AWG and smaller shall be nylon self-insulated, ring tongue or locking-spade terminals. Connectors for wire sizes No. 8 AWG and larger shall be one-hole lugs up to size No. 3/0 AWG and two-hole or four-hole for size 4/0 AWG and larger. Mechanical clamp, dimple, or screw-type connectors are not acceptable.

   480-volt motor terminations shall be made using bolt connected lugged connectors and factory engineered kits consisting of heat shrinkable, polymeric insulating material with high dielectric strength mastic sealant.

   Termination of solenoid valves, 120-volt motors, and other devices furnished with pigtail leads shall be made using self-insulating, tubular compression connectors.

2. Terminal Blocks: Terminal blocks shall be provided for external control and power wires size 10 AWG and smaller. Terminal blocks shall be 600 volts, heavy-duty, rated 20 amperes for control and 30 amperes for power.

G. Wire Markers: Wire markers shall be yellow or white shrink tubing, Thermofit Marker System (TMS) by Raychem Co., Thomas and Betts equivalent, or equal for conductors No. 10 AWG and smaller and locking tab cable markers, W.H. Brady Co., Thomas and Betts, or equal, for conductors No. 8 and larger. Letters and numbers identifying each conductor shall be machine printed in permanent black ink.

2.4 WIRING DEVICES

A. General: Receptacles, plugs, switches, and appurtenances shall be provided as specified on the drawings. Wiring devices shall be UL approved for the current and voltage specified and shall comply with NEMA WD-1. Receptacles and switches shall be premium, specification grade. GFI type in weather proof cover/box shall be provided for all outdoor receptacles.

B. Receptacles: Receptacles shall be 20A, 120V, and grounding type. Receptacles for use outdoors and in wet process areas shall be corrosion resistant, GFI type, marine duty with polycarbonate weatherproof lift covers, Hubbell 53CM62/ 53CM21, General Electric, or equal.

C. Switches: Switches for use outdoors and in wet process areas shall be 20 amp, press-switch type with weatherproof, corrosion-resistant neoprene plate, Hubbell, Arrow-Hart, or equal. Switches located in classified hazardous locations shall be suitable for installation

in such locations. They shall be made by Killard Hazloc Series, Appleton, Crouse-Hinds, or equal.

2.5 INDIVIDUAL MOTOR STARTERS

A. General: Unless otherwise specified, individual motor starters shall be combination type with molded case motor circuit protector, 3-pole, 600-volt AC contactor, and three overload relays, NEMA size 1 minimum. Each motor starter shall be individually enclosed. Starters shall be manufactured by Cutler-Hammer, Allen-Bradley, General Electric, or equal.

B. Enclosures: The door of the motor starter enclosure shall be interlocked with an externally operated disconnect handle, lockable in the open position. Enclosures shall be NEMA 12 for dry indoor areas and NEMA 4X for outdoor and wet process areas.

C. Motor Branch Circuit Protection: Molded case motor circuit protectors shall be magnetic only with trip settings adjustable over a range of 700 to 1300 percent of the full load current of the motor served. The motor circuit protector, in conjunction with the starter, shall be rated to interrupt 42,000 amperes (symmetrical) unless otherwise specified.

D. Overload Relay: Overload relays shall be bimetallic type with separate heaters for each of the three poles. Reset shall be accomplished with a reset pushbutton located on the unit door exterior. Trip setting shall be adjustable from 85 to 115 percent of the motor full load rating.

E. Control Circuits: Control power transformers, fuses, and control devices shall be provided as specified. Two control transformer primary fuses, rated to interrupt 200,000 amperes at 600 volts, shall be provided on all motor starters. Each motor starter shall be provided with one control circuit secondary fuse rated to interrupt 10,000 amperes at 250 volts and sized at 125 percent of the control circuit full load current. Control circuit shall be 120 V with grounded leg.

F. Wiring: Conductors shall be switchboard type and rated 90 degrees C above ambient temperature. Conductor shall be identified with tag numbers as specified.

G. Manual Starters: Manual starters shall be provided as indicated on the drawings. Manual starters shall consist of a horsepower rated quick-make, quick-break toggle mechanism together with one or two overloads as specified. Voltage shall be as specified. Indoor and dry location shall be NEMA 12. For outdoor and wet process area, they shall be NEMA 4X corrosive resistant. For classified hazardous locations, they shall be rated for such locations and shall be manufactured by Square D, General Electric, or equal.

2.6 ELECTRICAL CONTROL DEVICES

A. Control Devices:

1. PUSHBUTTONS: Pushbuttons shall be flush head, 30mm diameter, heavy-duty, industrial, 600 volts, 10 amperes, continuous with NEMA rating to match enclosure types. Pushbutton operators shall be red for stop functions and black for all other functions. Escutcheon plates shall be as specified on the drawings. For field mounted pushbuttons, each stop pushbutton shall be provided with a

galvanized steel padlockable mechanism. For hazardous locations, the control stations shall be rated as explosion proof suitable for such locations. They shall be Killark Hazloc Series, Appleton, Crouse-Hinds or equal.

2. Selector Switches: Selector switches shall be heavy-duty, 30mm diameter, industrial type, with NEMA rating to match enclosure type, rated 600-volt, 10-ampere, continuous. Switches shall be provided with contact blocks and number of positions as required performing the specified operations. The escutcheon legend shall be as specified on the drawings.

3. Indicating Lights: Indicating lights shall be 30mm diameter, industrial, heavy-duty, push-to-test, transformer type with LED lamps. Indicating lights shall be NEMA rated to match enclosure type. Color of lens shall be as specified.

4. Control Stations: Unless otherwise specified, control stations shall be NEMA 12 or 13 for dry, indoor locations and NEMA 4X for process areas and outdoor locations, Allen Bradley Bulletin 800H, Crouse-Hinds NCS series, or equal.

5. Security (limit switches). Where required and shown on the drawings, Security switches shall be heavy duty, industrial type with adjustable arm, lever made of stainless steel material. Each switch shall have one normally open and one normally closed contact rated for at least 5A at 120VAC. The switches shall be NEMA 4X, and shall be as manufactured by General Electric, Square D, or equal.

6. Thermostats: Where required and shown on the drawings, thermostat shall be heavy duty, line voltage, NEMA 4X, 20A 120V rated with dial and indicator suitable for line connection. They shall be manufactured by Dayton, Honeywell, or equal.

B. Control Relays:

1. Load-Switching Control Relays: Where required and shown on the drawings, control relays used for switching loads (solenoids, actuators, contactors, motor starter coils, etc.) shall be heavy-duty, machine tool type. Relays that have contacts used for remote interlocking or for which the switching load is not shown shall also be heavy-duty machine tool type.

   Contacts shall, as a minimum, be 4-pole and be field interchangeable to either normally open or normally closed. Relay shall be capable of accepting a 4-pole adder.

   AC relays shall have NEMA A600 contact ratings and electrical clearances for up to 600 volts. DC relays shall have NEMA P300 contact ratings and electrical clearances of up to 250 volts.

   Relays shall be Allen Bradley Bulletin-700, Square D Class 8501, or equal.

2. Logic Level Switching Control Relays: Control relays used for switching solid-state logic and signal circuits shall be Potter Brumfield series KUP, Schrack Series RA, or equal. Relays shall have a minimum of three SPDT, gold-flashed, fine silver contacts rated 3 amps resistive at 120 volts AC or 28 volts DC. Relay

shall be plug-in type with heavy-duty, barrier-protected screw terminal sockets and clear polycarbonate dust cover with clip fastener. AC models shall have neon lamp indicator wired in parallel with coil.

3. Timing Relays: Solid state timing relays shall be pulse-count type using a high frequency RC oscillator and integrated circuit counter for timing. Electrolytic capacitors shall not be used in the timing circuits. Time delays from 0.1 seconds to 48 hours shall be available with each timer model adjustable over a 20:1 range. On-delay, off-delay, and single-shot timing models shall be available. Timer shall reset in 0.03 seconds or less. Timer accuracy shall be plus or minus 2.0 percent under normal conditions. The timing relay shall have two NEMA Form-C timed contacts. Solid state timing relays shall be Agastat, STA series, Eagle Signals equivalent, or equal.

4. Intrinsically Safe Relays: Where required and shown on the drawings, these relays shall be suitable for use with 24VDC power source with pilot devices located in hazardous classified locations as defined by NEC Article 500. The relays shall be manufactured by:

   a. R.K Electronics
   b. Gem Sensors Divison of IMO, Inc
   c. R. Stalh, Inc.
   d. Idec
   e. Equal

   Provide each relay with two DPDT contacts each rated for at least 5-amp.

   All float switches located in Class 1 Div I and Class 1 Div II hazardous location where shown shall be provided with intrinsically safe relays located in control panel or where specifically shown on the drawings .

2.7 GROUNDING MATERIAL

A. Cable: Grounding cable shall be concentric stranded, annealed bare copper. Cable size shall be as specified, and shall not be smaller than #4/0 AWG.

B. Ground Rods: Where required and shown on the drawings, ground rods shall be copper-covered steel, 3/4-inch diameter, and 10 feet long. Rods shall have threaded type, removable caps so that extension rods of the same diameter and length may be added where necessary. The rods shall be manufactured by ERICO, Galvan Industries, Inc. or equal.

C. Compression Connectors: Compression connectors shall be cast copper as manufactured by Thomas and Betts, OZ. Gedney, or equal.

D. Bolted Connectors: Bolted connectors shall be Burndy, O.Z. Gedney, or equal.

E. Equipment Grounding: Install a green insulated equipment grounding conductor with each feeder and branch circuit from the power source grounding means to the load equipment or device.

2.8 LIGHTING FIXTURES:

Furnish and install new lighting fixtures as shown on the drawings.

2.9 DISTRIBUTION EQUIPMENT

A. Panelboards: Where required and shown on the drawings, panelboards shall be circuit breaker, dead front type with bus bar construction. Panelboards shall be composed of individually mounted circuit breakers designed to be removed without disturbing other breakers.

Bus shall be tin-plated copper and shall have a current rating as shown on the panel schedules sized in accordance with UL 67. Panel fault withstand rating shall be equal to the interrupting rating of the smallest circuit breaker in the panel.

Panelboards shall be provided with a separate ground bus and a full capacity neutral bus. Neutral bus shall be mounted on insulated standoffs with removable link connector to ground bus. Provide an inside pocket to hold circuit directory. Panelboards shall be Cutler-Hammer, Allen-Bradley, or equal.

For outdoor locations where required and shown on the drawings , provide lighting panels with NEMA 4X enclosures with padlockable provisions.

For existing panelboards, new breakers shall match with the installed breakers including short circuit rating.

B. Circuit Breakers: Circuit breakers shall be molded-case type provided for the current ratings and pole configurations specified on the panelboard schedule. Circuit breakers rated 120/208 volts and 120/240 volts AC shall have a minimum interrupting current rating of 22K amperes (symmetrical) at 240 volts AC. Circuit breakers rated 277/480 volts AC shall have a minimum interrupting current rating of 42K amperes (symmetrical) at 480 volts.

Circuit breakers shall be bolt-on type.

Circuit breakers shall be listed in accordance with UL-489 for the service specified. Breakers rated 200A or higher shall be provided with solid-state trip unit with multi-functions.

Load terminals of circuit breakers shall be solderless connectors.

Circuit breakers and panelboards shall be products of the same manufacturer.

2.10 NAMEPLATES

Nameplates shall be made from laminated phenolic plastic. The nominal size of the nameplates shall be 3/4 inch high by 2 inches long. Nameplates shall have black backgrounds with 1/4-inch white letters. If abbreviations are required because of space limitations, abbreviations shall be submitted to the Construction Manager for approval prior to manufacture. Nameplates shall be fastened using self-tapping stainless steel screws. The use of adhesives will not be permitted on the outside of enclosures.

PART 3 EXECUTION

3. 1 GENERAL

Unless otherwise detailed or dimensioned, electrical layout drawings are diagrammatic. Actual conduit installation shall be coordinated with field conditions. Junction boxes and pull boxes with quantity as required shall be furnished and installed. The Contractor shall coordinate the location of electrical material and equipment with the work.

Electrical equipment shall be protected from dust, water, and damage.

3.2 RACEWAY, FITTINGS, AND SUPPORTS

A. General: The Contractor shall limit the number of directional changes of conduit to a total of not more than 270 degrees in any run between pull boxes. Conduit runs shall be limited to 400 feet, less 100 feet for each 90-degree change in direction.

Signal conduit shall be separated from AC power and control conduits. The minimum separation shall be 12 inches for rigid steel and 12 inches for PVC conduits.

Tag power, signal and control conduits with stainless steel tag fastened to conduit with stainless steel cable. Tags shall be engraved with identification as designated on the single-line diagrams. Tags shall be installed at each conduit termination to an enclosure, MCC, control panel, disconnect, motor j-box, signal transmitter, sensor etc..

B. Exposed Conduits: Rigid metallic conduit shall be assembled to provide a continuous ground path. Joints shall be made with standard couplings or threaded unions. Bends and offsets shall be made with a hickey or conduit bending machine or shall be factory preformed bends.

Exposed conduit shall be run on supports spaced not more than 10 feet apart and shall be constructed with runs parallel and perpendicular to walls, structural members, or intersections of vertical planes and ceiling. No conduit shall approach closer than 6 inches to any object operating above 30 degrees C.

Conduit supports shall be secured to concrete walls and ceilings by means of cast-in-place anchors, die cast, rustproof alloy expansion shields, or cast-flush anchors. Wooden plugs, plastic inserts, or gunpowder driven inserts are not acceptable as a base for securing conduit supports.

Liquidtight, flexible steel conduit shall be used for the final connection to equipment, devices, and instruments where flexibility is required.

The length of liquidtight flexible steel conduit shall not exceed the lesser of 15 times the trade diameter of the conduit or 36 inches.

C. Embedded or Encased Conduit: Conduits constructed in concrete which is in contact with earth shall be separated from earth by at least 3 inches of concrete. Clearances equal to the nominal conduit diameter but not less than 2 inches, shall be maintained between encased or embedded conduits except where conduits cross or terminate.

D. PVC-coated Rigid Galvanized Steel Conduit: All exposed conduits shall be PVC-coated rigid galvanized steel with matching conduit boxes and accessories.

E. "Eys" seals: Install "Eys" seals as required per NEC, and as shown on the drawings for hazardous locations and locations as identified on the drawings. Fill the seals with compound recommended by the seal manufacturer.

3.3 CONDUCTORS, WIRE, AND CABLE

A. General: Raceway construction shall be complete, cleaned, and protected from the weather prior to wire and cable being installed. Pulling wire and cable into conduit shall be completed without damaging or putting undue stress on the cable insulation. Soapstone, Talc, or UL listed pulling compounds are acceptable lubricants for pulling wire and cable. Grease is not acceptable. Nylon pull rope shall be pulled through the conduit immediately after concrete pour.

Each power, control, signal, and instrumentation conductor shall be identified at each terminal to which it is connected utilizing the wire markers specified in paragraph 16000-2.03 G.

600-volt conductors will be color coded as follows unless existing color code takes precedence:

480 V Power	120/208 Lighting and Receptacles
Phase A – Brown	Phase A – Black
Phase B – Orange	Phase B – Red
Phase C – Yellow	Phase C – Blue
Neutral – White	Neutral – White
Ground – Green	Ground – Green

B. 600-Volt Conductor and Cable: Slack shall be provided in junction and pull boxes. Slack shall be sufficient to allow cable or conductors to be routed along the walls of the box.

Conductors crossing hinges shall be bundled in groups not exceeding 12 and shall be so arranged that they will be protected from chaffing when the hinged member is moved.

Raceway fill limitations shall be as defined by NEC and the following:

Lighting and receptacle circuits may be together in the same conduit in accordance with derating requirements of the NEC. However, lighting and receptacle circuits shall not be in conduit with other circuits.

Solid wire shall not be lugged nor shall electrical spring connectors be used on any except for solid wires in lighting and receptacle circuits. Lugs and connectors shall be installed with a compression tool.

Care shall be taken to avoid damage to multiple conductors to be pulled in a conduit. Follow the manufacturer's requirements to assure maximum pulling tension is not exceeded. For pulling multiple conductors, the max pulling tension shall be reduced as required by the manufacturer. Use extra lubricant as required to assist with the pulling operation.

C. Signal and Instrumentation Cables: Signal and instrumentation circuits shall be run as individual shield twisted pairs or triads. Triads shall be used wherever three-wire circuits are required. Terminal blocks shall be provided at cable junction for running signal leads and shield drain wires. Each conductor shall be identified at such junctions. Instrumentation cables shall be continuous without any splices.

Shields shall not be used as a ground path.

3.4 WIRING DEVICES

Switches and receptacles for use outdoors and in process areas shall be mounted in "FD" type boxes or PVC-coated boxes in locations specified. Unless otherwise specified, switches shall be mounted 48 inches above the floor. Receptacles shall be mounted 18 inches above the floor in finished areas and 48 inches above the floor in process areas and outdoors unless otherwise specified.

3.5 INDIVIDUAL MOTOR STARTERS

Individual motor starters shall be mounted with the operating mechanism 48 inches above the finished floor unless otherwise specified. The Contractor shall size the overload heater elements to the nameplate full load amperes of the motor served. Motor circuit protectors shall be adjusted to the lowest setting not causing false tripping.

3.6 MISCELLANEOUS CONTROL DEVICES

Control stations shall be mounted 48 inches above the floor unless otherwise specified.

3.7 GROUNDING

Electrical equipment and enclosures, metal surfaces of equipment, and metal structural members shall be grounded. Grounding system shall be provided in compliance with the NEC and as specified on the drawings.

Embedded and buried cable connections shall be made by cast copper compression connectors utilizing diamond or hexagon dies and a hand compression tool for wire sizes 2 AWG and smaller and a hydraulic pump and compression head for wire size 2/0 AWG and larger. Embedded ground cables and fittings shall be securely attached to concrete reinforcing steel with tie wires.

Grounding conductors which extend beyond concrete surfaces for equipment connection shall be extended a sufficient length to reach the final connection point without splicing. Grounding conductors which project from a concrete surface shall be located as close as possible to a corner of the equipment pad, protected by conduit or terminated in a flush grounding plate.

Exposed ground connections shall be made by bolted connectors. Exposed grounding conductors shall be supported by noncorrosive metallic hardware at 4-foot intervals or less.

Grounding conductors entering enclosures shall be bonded together to the enclosure if it is metallic and to metallic raceway within terminating at the enclosure. Metal surfaces shall be cleaned prior to making grounding connections and bonds.

When install ground rods, field verify exact location of existing underground utilities such as water piping, gas piping, electrical conduits or ductbanks, vault or manholes etc prior to installation of the ground rods to avoid damage to the existing underground utilities.

3.8 LIGHTING FIXTURES

A. General: The location and type of fixtures and receptacles are shown on the drawings. Raceways and wire shall be provided from the fixtures, switches, and receptacles to the lighting panel in accordance with the NEC.

Fixtures labeled to require conductors with a temperature rating exceeding 75 degrees C shall be spliced to circuit conductors in a separately mounted junction box. Fixture shall be connected to junction box using flexible conduit with a temperature rating equal to or greater than that of the fixture.

Labels and marks, except the UL label, shall be removed from exposed parts of the fixtures. Fixtures shall be cleaned when the project is ready for acceptance.

For existing lighting fixtures to be replaced with new light fixtures, de-energize electrical circuit prior to installation and connection to existing circuits for complete operating units. All existing removed light fixtures shall be returned to the Owner.

3.9 PANELBOARDS

The contractor shall update and type in the circuit descriptions on the new circuit directory as shown on the final record drawings or panel schedule. Update existing directory with additional and new loads as shown in the panelboard schedules.

3.10 TESTING

A. General: Prior to energizing the electrical circuits, the tests shall be performed as specified. Unless otherwise specified, a 500-volt megohmmeter shall be used for resistance measurements.

The measurements of the tests shall be recorded on the specified forms and provided in accordance with paragraph 16000-1.3.

B. Insulation Resistance Measurements:

1. General: General insulation resistance measurements shall be made on conductors and energized parts of electrical equipment. Minimum acceptable values of insulation resistance shall be in accordance with the applicable ICEA,

NEMA, or ANSI standards for the equipment or material being tested, unless otherwise specified. The ambient temperature at which insulation resistance is measured shall be recorded on the test form.

2. Conductor and Cable Tests: The phase-to-ground insulation resistance shall be measured for all circuits 120 volts and above except lighting circuits. Measurements may be made with motors and other equipment connected. Insulation resistance measurements shall be recorded and submitted to the Engineer for review and approval. Insulation with resistance of less than 10 megohms is not acceptable.

3. Motor Tests: All motors shall have their insulation resistance measured before they are connected. Motors 50 HP and larger shall have their insulation resistance measured at the time of delivery as well as when they are connected. Insulation resistance values less than 10 megohms are not acceptable.

C. FUNCTIONAL CHECKOUT:

Prior to energization of equipment, the Contractor shall perform a functional checkout of the control circuit. Prior to functional testing, all protective devices shall be adjusted and made operative. Checkout shall consist of energizing each control circuit and operating each control, alarm or malfunction device and each interlock in turn to verify that the specified action occurs. Contractor shall submit a description of his proposed functional test procedures prior to the performance of functional checkout.

The Contractor shall verify that motors are connected to rotate in the correct direction. Verification may be accomplished by momentarily energizing the motor, provided the Contractor confirms that neither the motor nor the driven equipment will be damaged by reverse operation.

D. GROUNDING SYSTEM TESTS:

The Contractor shall test existing grounding system at existing MCC-A building to determine the ground resistance. The grounding test shall be IEEE Standard 81. A plot of ground resistance readings for each isolated ground rod or ground mat shall be provided to the Construction Manager on 8-1/2 x 11 inch size graph paper. The current reference rod shall be driven at least 100 feet from the ground rod or grid under test. The measurements shall be made at 10-foot intervals beginning 25 feet from the test electrode and ending 75 feet from it, in direct line between the ground rod or center of grid and the current reference electrode. Direct ground reading meters are also acceptable in lieu of using ground rods for tests.

A grounding system that shows greater than 2 ohm resistance for the flat portion of the plotted data shall be considered inadequately grounded. The Contractor shall add additional parallel connected ground rods and/or deeper driven rods until the ground resistance measurements meet the 2 ohm requirement. Ground rods required over that specified will be paid for as extra work. Use of salts, water, or compounds to attain the specified ground resistance is not acceptable.

3.11 RECORD DRAWINGS

Record drawings refer to those documents clearly maintained and annotated with red pen or red notes and changes on the PDF by the Contractor during construction include record drawings in accordance with these specifications including requirements in Section 01730 Record Drawings. Contractor shall submit record drawings that reflect as-installed conditions. Drawings do not conform or do not show as installed conditions shall be rejected and shall be resubmitted by the Contractor for no additional cost to the City until acceptance by the Engineer. Markups for deviations and changes shall be on a full size set of drawings.

END OF SECTION

SECTION 16025
ELECTRICAL DEMOLITION AND MODIFICATIONS

PART 1 GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials, and incidentals required to demolish, modify and/or remove the electrical and instrumentation systems and equipment as shown on the Drawings or specified herein. All demolition work shall be performed by licensed electricians. All electrical sources shall be field verified to be de-energized prior to demolition work.

B. Unless specifically noted as being reused, all conduit, wire, boxes, etc. detailed on the Drawings shall be new equipment installed under this Work.

C. The electrical modifications and removals work shall consist of, but not necessarily be limited to, removal or modifications of existing equipment in the following generalized categories:

1. Modification of motors, motor starters, panels, lights, outlets and other devices as indicated on the Drawings.

2. Any electrically powered or controlled equipment indicated as being removed in this Contract and associated electrical appurtenances.

3. Existing electrical equipment or electrical equipment associated with mechanical or process equipment which needs to be removed or relocated due to conflicts with new construction. Complete reconnections (power and signal) are required with new power and signal cables to reach new location.

4. Electrical control devices, starters, wiring, and other miscellaneous devices associated with equipment that will be modified or reused under this Contract.

5. Instrumentation and control equipment and related conduit and wire associated with equipment being removed under this Contract.

1.2 RELATED WORK

A. Additional requirements for equipment demolition and salvage are specified in Section 02050 – Demolition

1.3 SUBMITTALS

A. All submittals shall be in accordance with Specifications.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 EQUIPMENT TO BE REMOVED

A. Only the major electrical and instrumentation equipment to be removed is shown or noted on the Drawings and failure to detail all equipment exactly shall not relieve the Contractor from the responsibility for its removal as directed by the Engineer. Removal items such as wire, conduit, junction boxes, anchorages, etc. are in general not detailed on the Drawings.

B. Where removal of electrical, instrumentation, or any other equipment with wired connections is called for in this Work, the work shall include the removal of the associated electrical hardware as specified herein unless noted otherwise.

C. Unless otherwise noted, all wiring shall be removed from the conduits; boxes and fittings and all exposed conduit shall be removed. Unless specifically noted otherwise, concealed conduits shall be cut flush with the floor, wall, or ceiling and plugged with non-shrink grout.

D. Electrical power, control, or instrumentation equipment, exposed conduit, wiring, etc. rendered inoperative by modifications to existing equipment under these sections or other Divisions of this contract shall be removed unless specifically noted that it is to be abandoned in place.

E. Not all existing conduits are shown on the Drawings. In general, existing conduits are shown only where they may be reused; or where they potentially affect or may be affected by new work under this Contract; or for providing useful background information to the Contractor regarding the existing electrical installation.

F. Where existing conduit or wire associated with removed equipment is to be reused, it will be specifically noted on the Drawings or Conduit and Cable Schedules.

G. No existing conduits, wiring, or electrical appurtenances shall be removed or in any way damaged unless allowed by the provisions of this Section. Any existing conduits or wiring or other electrical appurtenances that are encountered as an obstruction to new construction which are not covered by the provisions of this Specification shall be brought to the attention of the City.

H. Where functions of existing cables or conduits are replaced by new cable or conduits because of additions of new panels, instruments, revision to control strategy, etc., the existing cables and exposed conduits shall be removed unless noted otherwise. Where shown on the drawings, or where terminating in equipment enclosures, concealed conduits shall be retained and marked as spares.

I. Equipment removed shall not be reused under this contract unless specifically noted on the Drawings or Specifications.

J. To minimize disruptions to the existing plant operations, the schedule for modifications and removal of existing equipment shall be coordinated with and approved by the Engineer and City.

K. Where, if applicable, any existing circuits are disconnected due to abandonment or removal of existing equipment, the remaining motor starters or circuit breakers for these circuits shall be retagged as spares. At motor control centers, the tags shall be laminated nameplates matching the existing ones. In circuit breaker panels, the circuit card or listing shall be changed.

L. Demolished and removed equipment, conduit, wire, etc., shall become the property of the Contractor unless specifically noted otherwise on the Drawings. Contractor shall be responsible for disposing removed equipment in conformance with the requirements of Section 02050 - Demolition. Where specifically shown on the Drawings, selected electrical equipment shall be protected, removed and turned over to the City per the requirements of Section 02050 - Demolition.

M. Refer to mechanical sections for removal of existing diesel fuel tank and dispose of the hazardous substance in accordance with Federal and State Regulations.

3.2 EQUIPMENT SALVAGED

A. All existing light fixtures and poles that are replaced with new fixtures and new poles.

B. All existing magnetic flow meters and sensors that are replaced with new units.

END OF SECTION

SECTION 16075
ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.2 SUMMARY

A. Section Includes: Identification of electrical conductors, raceways and equipment, and electrical equipment signs.

B. Related Sections:

1. Section 16000 – Requirements for Electrical Work

1.3 REFERENCES

A. National Electrical Code (NEC):

1. Article 110–22 - Disconnecting Means.
2. Article 210–4 - Multi-wire Branch Circuits.
3. Article 200 - Use and Identification of Grounded Conductors.
4. Article 384 - Switchboards and Panelboards.
5. Article 300 - Wiring Methods.

1.4 SUBMITTALS

A. Shop Drawings:

1. General: Submit Shop Drawings for electrical equipment room layouts, drawn at a minimum at 3/8 inch = 1 foot, scale.
2. Cross Reference: Diagram shall carry a uniform and coordinated set of wire numbers and terminal block numbers to permit cross-referencing between the Contract Document Drawings, the Drawings prepared by the CONTRACTOR, and equipment O&M Manual Drawings.
3. Drawing number cross references and continuation references shall also be provided. Contractor-prepared Drawings shall reference applicable CONTRACTOR Drawings such as P&IDs, control and logic diagrams, interface wiring diagrams, Panel Drawings, etc. Contractor-prepared Drawings shall also reference applicable Drawings provided by equipment manufacturers.
4. On any Drawing prepared for this project, if a wire, circuit, enclosure, panel, or device is continued on another Drawing, the continuation Drawing shall be referenced (and vice-versa). Wherever wires are shown connected to terminals, the Drawings which show the continuation of the circuits on those terminals must be referenced.
5. Interconnection Diagrams: Cables shall not be installed into raceways until the wiring interconnection diagrams are reviewed by the design engineer.
6. Sample schematics and diagrams are indicated on typical detail Drawings for reference and understanding of minimum information required for submittal of

Shop Drawings schematics and diagrams, and submittal of O&M schematics and diagrams.

7. Include tagging system, labels, markers, hazard tape, nameplates, and signs.

B. Product Data: Include tagging system, labels, markers, and hazard tape.

C. Project Record Documents:

1. Document wire, cable, and conductor tags, and bundle tags installed in accordance with the Contract Documents.
2. Document installed wire, cable, and conductor tags and bundle tags when not specifically indicated.
3. Indicate on Record Drawings deviations from accepted Shop Drawing conductor identification.

1.5 QUALITY ASSURANCE

A. Pre-installation Meeting:

1. Conduct in accordance with Section 16000.
2. Purpose: To clearly define requirements specified for circuit/cable/conductor identification, hold a meeting including representatives of CONTRACTOR, CITY, and ENGINEER prior to significant cable or conductor purchase and installation/termination.

PART 2 PRODUCTS

2.1 LABELS

A. Manufacturers: One of the following or equal:

1. Brady.
2. Seton.

B. Type: Sleeve type.

2.2 CONDUCTOR AND CABLE MARKERS

A. Manufacturers: One of the following or equal:

1. Brady.
2. Seton.

B. Type: Slip-on PVC sleeve or strap-on type.

C. Printed using Brady marker "XC PLUS," or equal.

D. Markers used in tunnels or other wet locations shall be on heat-shrinkable marking sleeves.

E. Use self-laminating vinyl on white background for markers within electrical equipment such as panels, termination cabinets, motor control centers.

F. Use engraved stainless steel tags with circuit designation fastened to direct buried cables in underground pull boxes as detailed on the drawings.

2.3 RACEWAYS IDENTIFICATION (TAGS)

A. Conduit numbers shall be pressure stamped into a non corrosive 2 inch long, 1/2 inch wide stainless steel tape, Dymo marking system or equal. A tag with number shall be fixed with No. 18 AWG or larger type 304 stainless steel wire, to each conduit segment and at the end of each conduit and within 3 feet of each pull box, panelboard, and switchboard.

2.4 NAMEPLATES, LABELS AND SIGNS

A. Nameplates:

1. Type: Black lamicoid with white letters.
2. Fastener: Round head stainless steel screws.

B. Automatic Equipment and High Voltage Warning Signs:

1. Type: Suitable for exterior use and meeting OSHA regulations.

C. Power Pole Labels: Vinyl plastic with details as shown on the drawings.

1. Manufacturers: One of the following or equal:
   a. Brady.
   b. Seton.

D. Underground Hazard Tape: 6 inches wide. Detectable, aluminum with warning wording.

1. Manufacturers: One of the following or equal:
   a. Panduit.
   b. Thomas and Betts.

PART 3 EXECUTION

3.1 CIRCUIT IDENTIFICATION

A. Identify 3-phase system conductors and cables as Phases A, B, and C and identify 1-phase system conductors and cables at electrical equipment including, but not limited to, switchgear, switchboards, panelboards, motor control centers, and motors.

1. Match CITY’s existing electrical system identification scheme or meet requirements of the authority responsible for the project.
2. 3-phase 480 Volts AC System Conductors: Phase A, brown; Phase B, orange; Phase C, yellow.

3. Single-Phase Conductors for 120/240 VAC Circuits: Phase A, black; Phase B, red; Phase C, blue.
4. Neutral Conductor: White for 120 VAC and gray for 277 VAC.
5. Insulated Equipment Grounding Conductor: Green.
6. General Purpose AC Control Conductors: Violet.
7. General Purpose DC Control Conductors: Violet with white stripes.
8. Where used, identify 15 kilovolt class cables with 3 stripes of color tape specified in item 3 above.
9. Where used, identify 5 kilovolt cable with 2 stripes of color tape specified in item 3 above.

B. Use color coding and phasing consistent throughout the site. Bus bars at panelboards and motor control centers to be connected Phase A-B-C, top to bottom, or left to right facing connecting lugs.

C. Conductors Number 2 American Wire Gauge (AWG) and smaller to be factory color coded with a separate color for each phase and neutral, which shall be used consistently throughout the system. Larger cables to be coded by the use of colored tape.

D. In addition to color coding, for all 1-phase and 3-phase systems, identify each cable (single or multi-conductor) and conductor at each end, in each manhole, pullbox, cable tray, or other component of the raceway system. This identification is applicable to all power, control, alarm, signal, instrumentation cables, and conductors.

E. Identify each cable (single or multi-conductor) and groups or bundles of individual single conductors in each manhole, pullbox, cable tray, or other component of the raceway system with circuit identification markers. Implement a "from-to" cable/conductor bundle tagging system as part of this identification effort.

F. Identify each individual conductor at each termination and in manhole and underground or above ground pull boxes. This includes such locations as switchgear, switchboards, motor control centers, variable frequency drives, control panels, junction/terminal boxes, all field devices, and all other locations where conductors are terminated. Identify the termination of these conductors in accordance with the accepted Shop Drawings. Tag conductors with sleeve type labels.

G. Where more than 1 nominal voltage system exists, identify each ungrounded system conductor by phase and system. Permanently post means of identification at each branch-circuit panelboard, switchboard, switchgear, motor control center, or other type of power distribution equipment.

H. Include the following minimum information for wire and cable identification.

1. Circuit number or load identification tag number as per section 16075.
2. Origin (from source).
3. Destination (to load).

3.2 NAMEPLATES

A. Furnish and install nameplates for all electrical equipment indicated on the Drawings. Each disconnect, control system, control panel, breaker, switch, panelboard, MCC, switchboard, control panel, etc., shall have nameplate indicating equipment name and circuit designation.

B. Each disconnect means for service, feeder, branch, or equipment conductors and pushbutton stations shall have nameplates indicating its purpose or identifying the load.

C. Each lighting switch and convenience outlet shall have a nameplate indicating its 120VAC power circuit number from lighting panelboard. Nameplate shall be affixed to the faceplate of the device with heavy duty adhesive cement.

3.3 AUTOMATIC EQUIPMENT WARNING

A. Mount permanent warning signs at mechanical equipment which may be started automatically or from remote locations. Fasten warning signs with round head stainless steel screws or bolts, located and mounted in a manner acceptable to ENGINEER.

B. Mount permanent and conspicuous warning signs on (front and back) equipment, doorways to equipment rooms, pull boxes, manholes, where the voltage exceeds 600 volts.

C. Place a warning ribbon or other effective means suitable for conditions above ductbank underground installations.

D. Place warning signs on utilization equipment that has more than one source of power. Provide panel and circuit number of conductor tag of the power source disconnect.

E. Place warning signs on utilization equipment that has 120 VAC control voltage source used for interlocking. Provide panel, circuit number, and conductor tag of control voltage source disconnect.

3.4 CONDUIT TAGS

A. Install conduit tags (engraved stainless steel round tags) at each conduit termination to control panel, MCC, enclosure, disconnect, pull box, junction box etc.. Conduit tag names shall be as per single-line and control one-line diagrams shown on the drawings.

END OF SECTION

SECTION 16222
MOTORS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Single phase motors, direct current motors, and 3-phase motors up to and including 400 horsepower.

1.2 REFERENCES

A. American Bearing Manufacturers Association (ABMA):
   1. ABMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
   2. ABMA 11 - Load Ratings and Fatigue Life for Roller Bearings.

B. Institute of Electrical and Electronic Engineers (IEEE).

C. National Electrical Manufacturers' Association (NEMA):
   1. MG-1 - Motors and Generators.

1.3 DEFINITIONS

A. Solid-State Motor Controller: Includes variable frequency drives and solid-state reduced voltage starters.

B. Nominal Efficiency: The average full load efficiency value of a large population of the manufacturer's motors of the same design.

C. Minimum Efficiency: The minimum full load efficiency value of any individual motor associated with the nominal motor efficiency.

1.4 SUBMITTALS

A. Product Data:
   1. Descriptive bulletins.
   2. Outline Drawings with dimensions.
   3. Cut-away and exploded view Drawings.
   4. Parts list with material designations.
   5. Nameplate data.
   6. Motor weight, frame size, and conduit box location.
   7. Description of insulation system.

B. Design and Performance Data:
   1. Bearing design and bearing life calculations.
   2. Performance Data Required by Schedule A, Nameplate Data, and Following Information:
      a. Service factor.
      b. Efficiency at 1/2 and 3/4 load.

c. Power factor at 1/2 and 3/4 load.
d. When required for power factor improvement, capacitor size in KVAR with calculation data for motors sized 50 horsepower and above.

3. Special features including condensation heaters and winding temperature detectors.
4. Performance data for motors with synchronous speed of 900 revolutions per minute and below.
5. Factory test reports with test reference standard identified.

1.5 QUALITY ASSURANCE

A. Certification:
1. When motors are driven by variable speed drive systems, submit certification that selected motor:
a. Is capable of satisfactory performance under the intended load.
b. Is suitable for operation with the proposed variable speed drive unit.

B. Rating:
1. All motors provided for this project shall be suitable for an elevation of 1,250 feet without derating.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Motors: One of the following or equal:
1. U. S. Motors.
2. General Electric.
3. Reliance.

2.2 ELECTRICAL MOTORS

A. General:
1. Manufactured with cast iron frames in accordance with NEMA MG 1, and in accordance with specified requirements.
2. Alternating Current Motors: Squirrel cage induction type suitable for 60 hertz power.
3. Where not otherwise specified or indicated on the Drawings:
a. Motors 1 Horsepower and Larger: 3-phase, 460 volt AC
b. Motors less than 1 Horsepower: Single phase, 120 volt AC
4. 2-Speed Motors: Dual winding design.
5. Temperature Rating and Altitude Requirements: Where not otherwise specified or indicated on the Drawings, provide motors that are rated suitable for continuous operation in 40 degree Celsius ambient temperature at project site altitude.
a. Temperature Rise Under Full Load: Not to exceed that for Class B insulation (80 degrees Celsius).
6. Motor Data: Specific motor data including horsepower, speed, and enclosure type are indicated on the Drawings and specified under equipment for which motor is required.
7. Torque and Power of Motors:

a. Provide motors that develop sufficient torque for required service throughout acceleration range at voltage 10 percent less than motor nameplate rating.
b. Provide motors that develop sufficient torque when started using reduced voltage starters.

8. Motor Leads and Insulating Material: Insulated leads with non-wicking, non-hydroscopic material. Class F insulation.
9. Grounding Lugs: Provide inside conduit boxes for motor frame grounding.
10. Hardware: Type 316 stainless steel.

B. Provide motors that are special premium efficiency type, except motors that are to be used on hoisting equipment, heat pumps, unit heaters, sump pumps, and lubricating oil transfer pumps.
1. Provide premium efficiency type motors having nominal full load efficiencies and power factors as specified in Schedule A appended to this Section.
2. Actual full load efficiency of individual motors within the nominal efficiency band shall not be less than the minimum efficiency value specified in Schedule A.

C. Condensation Heaters:
1. Use: Required in motors in outdoor applications.
2. Type: Cartridge or flexible wrap-around type installed within motor enclosure adjacent to core iron.
3. Rating, Phase and Wattage: Rated for 120 volt, single phase with wattage as required.
4. Bring power leads for heaters into conduit box.

D. Winding Temperature Detectors:
1. When specified for individual equipment and on alternating current motors connected to a solid-state motor controller, provide factory installed winding temperature detector with leads terminating in conduit box.
2. Provide detectors that protect motor against damage from overheating caused by single phasing, overload, high ambient temperature, abnormal voltage, locked rotor, frequent starts, or ventilation failure.
a. For Motors Less than 200 Horsepower: Provide detector that has normally closed contacts.
b. For Motors 200 Horsepower and Larger: Provide with resistance temperature detectors, 2 per each phase.
3. Auxiliary Relays and Controls: Provide relays and controls and mount them in controller enclosure which is suitable for the environment.

E. Internal Cooling Motors: Design motors having speeds of 900 revolutions per minute and less, and motors that are connected to solid-state motor controllers with special attention to internal cooling.

2.3 SINGLE PHASE MOTORS

A. Capacitor start type rated for operation at 115 volts, 60 hertz, unless otherwise specified or indicated on the Drawings.

B. Totally enclosed, fan cooled motors manufactured in accordance with NEMA MG 1-10.35.

C. Ball Bearings: Sealed.

D. 1/2 Horsepower or Less Fan Motors:
   1. Split-phase or shaded pole type when standard for the equipment.
   2. Open type when suitably protected from moisture, dripping water, and lint accumulation.

E. Wound rotor or commutator type single-phase motors only when their specific characteristics are necessary for application and their use is acceptable to the ENGINEER.

2.4 3-PHASE MOTORS

A. Suitable for 460 volt 3-phase power unless otherwise specified or indicated on the Drawings.

B. NEMA Design B except where driven load characteristics require other than normal starting torque.
   1. Starting kilovolt ampere per horsepower (locked rotor) are not to exceed values specified in NEMA MG-1-10.37.

C. Motor Bearings: Antifriction, regreasable, and filled initially with grease suitable for ambient temperatures to 40 degrees Celsius.
   1. Suitable for intended application and have ABMA B-10 rating life of 60,000 hours or more.
   2. Fit bearings with easily accessible grease supply, flush, drain, and relief fittings using extension tubes where necessary.
   3. Provide two pole motors with sleeve type bearings.

D. Insulation Systems:
   1. Comply with NEMA 1-1.65.
   2. Class F system with Class B temperature rise.
   3. Resistant to attack by moisture, acids, alkalies, and mechanical or thermal shock.

E. Conduit Boxes: Cast iron or stamped steel, split from top to bottom and capable of being rotated to 4 positions.
   1. Provide gaskets between following:
      a. Frames and conduit boxes.
      b. Conduit boxes and box covers.

F. Motor Enclosures: When enclosure type is not specified in individual equipment specifications, provide a Totally Enclosed Fan Cooled (TEFC) enclosure for non-hazardous (unclassified) areas and explosion-proof enclosure for hazardous (classified) areas:
   1. Totally Enclosed Fan Cooled: Cast iron conduit box; 1.15 service factor at 40 degrees Celsius ambient; tapped drain holes with Type 316 stainless steel plugs for frames 286T and smaller, and automatic breather and drain devices for frames 324T and larger; upgraded insulation by minimum of 3 dips and bakes and sealer coat of epoxy or silicone.
   2. Explosion-Proof: 1.15 service factor at 40 degrees Celsius; tapped drain holes with corrosion resistant plugs for frames 286T and smaller and automatic breather and

drain devices for frames 324T and larger; UL label for Class I, Division 1, Group D hazardous area.

3. For special application such as corrosive environment, use a Severe Duty motor. Corrosion resistant type conforming to motors designated by manufacturer as "Chemical Duty," "Mill and Chemical," "Custom Severe Duty," or similar applicable manufacturer's quality designation with 1.15 service factor at 40 degrees Celsius; tapped drain holes with Type 316 stainless steel plugs for frames 286T and smaller and automatic breather and drain devices for frames 324T and larger; epoxy finish; and upgraded insulation using encapsulated or dip and bake windings.
4. Submersible: Watertight casing with insulated windings which are moisture resistant.
    a. Pump Motors Specified to be Submersible: Provide motors having cooling characteristics suitable for continuous operation in totally, partially, or non-submerged condition without overheating or other damage.
    b. Electrical Cables: Provide cables of adequate length to allow unit to be wired without splices.
5. Open Drip Proof where specified elsewhere: Stamped steel conduit boxes; 1.15 service factor at 40 degrees Celsius.

2.5 MOTOR SIZES

A. Motor sizes specified in the Specifications and indicated on the Drawings are minimum sizes.

B. Provide motors, electrical circuits, and equipment of ample horsepower capacity to operate equipment without exceeding rated nameplate horsepower, full-load current at rated nameplate voltage, or overheating at maximum load capacity.

2.6 SOURCE QUALITY CONTROL

A. Factory Testing of 3-Phase Motors:
    1. When specified in individual equipment Specifications, factory test motors. Include testing of:
        a. No load current.
        b. Locked rotor current.
        c. Winding resistance.
        d. High potential.
    2. Perform in accordance with applicable NEMA Standards.
    3. Furnish copies of test reports.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install motors in accordance with manufacturer's instructions.

3.2 SCHEDULES

A. Schedule A: Full load motor efficiency and power factor rating requirements for premium efficiency, 460 volt, 3-phase horizontal motors.

SCHEDULE A

FULL LOAD MOTOR EFFICIENCY AND POWER FACTOR RATING REQUIREMENTS FOR PREMIUM EFFICIENCY, 460 VOLT, 3 PHASE HORIZONTAL AND VERTICAL MOTORS

		Protected (Open Drip Proof)[1]			Totally Enclosed Fan Cooled[1]		
Nominal Horsepower (Horsepower)	Syn. (revolutions per minute)	Minimum Efficiency (Percent)	Nominal Efficiency (Percent)	Power Factor (Percent)	Minimum Efficiency (Percent)	Nominal Efficiency (Percent)	Power Factor (Percent)
1	1,800	81.5	84.0	70.9	81.5	84.0	77.7
	1,200	78.5	81.5	57.0	78.5	81.5	57.0
2	3,600	81.5	84.0	87.7	84.0	86.5	87.7
	1,800	81.5	84.0	76.7	81.5	84.0	78.8
	1,200	84.0	86.5	68.1	85.5	87.5	68.1
3	3,600	80.0	82.5	90.4	84.0	86.5	82.8
	1,800	86.5	88.5	78.9	86.5	88.5	79.2
	1,200	87.5	89.5	71.0	87.5	89.5	71.0
5	3,600	86.5	81.5	84.5	86.5	88.5	87.0
	1,800	87.5	88.5	80.4	86.5	88.5	81.0
	1,200	88.5	89.5	73.0	87.5	89.5	74.4
	900	87.5	87.5	70.0	87.5	89.5	70.5
7-1/2	3,600	86.5	88.5	86.7	87.5	89.5	86.3
	1,800	87.5	89.5	83.3	88.5	90.2	84.4
	1,200	88.5	90.2	78.2	88.5	90.2	78.3
	900	87.5	89.5	72.0	87.5	89.5	72.0
10	3,600	88.5	90.2	85.5	89.5	91.0	87.5
	1,800	88.5	90.2	82.8	88.5	90.2	86.0
	1,200	89.5	91.0	80.5	89.5	91.0	81.0
	900	89.5	91.0	75.8	88.5	90.2	76.0

SCHEDULE A

FULL LOAD MOTOR EFFICIENCY AND POWER FACTOR RATING REQUIREMENTS FOR PREMIUM EFFICIENCY, 460 VOLT, 3 PHASE HORIZONTAL AND VERTICAL MOTORS

		Protected (Open Drip Proof)[1]			Totally Enclosed Fan Cooled[1]		
Nominal Horsepower (Horsepower)	Syn. (revolutions per minute)	Minimum Efficiency (Percent)	Nominal Efficiency (Percent)	Power Factor (Percent)	Minimum Efficiency (Percent)	Nominal Efficiency (Percent)	Power Factor (Percent)
15	3,600	88.5	90.2	86.7	89.5	91.0	87.4
	1,800	90.2	91.7	81.9	91.0	92.4	82.7
	1,200	89.5	91.0	81.7	90.2	91.7	78.9
	900	89.5	91.0	76.8	88.5	90.2	77.0
20	3,600	90.2	91.7	87.1	90.2	91.7	88.7
	1,800	91.0	92.4	83.1	91.0	92.4	84.2
	1,200	90.2	91.7	83.7	90.2	91.7	79.0
	900	90.2	91.7	77.2	89.5	91.0	77.2
25	3,600	90.2	91.7	88.1	91.0	92.4	85.5
	1,800	91.7	93.0	82.7	92.4	93.6	84.3
	1,200	91.0	92.4	79.2	91.0	92.4	83.5
	900	90.2	91.7	76.3	90.2	91.7	76.4
30	3,600	91.7	93.0	88.3	91.0	92.4	73.9
	1,800	91.7	93.0	83.3	92.4	93.6	83.1
	1,200	91.7	93.0	82.1	91.7	93.0	83.5
	900	91.7	93.0	76.0	91.0	92.4	76.5
40	3,600	92.4	93.6	89.2	92.4	93.6	87.5
	1,800	93.0	94.1	80.8	93.0	94.1	82.3
	1,200	92.4	93.6	82.2	92.4	93.6	80.5
	900	91.7	93.0	75.0	91.7	93.0	75.5

SCHEDULE A

FULL LOAD MOTOR EFFICIENCY AND POWER FACTOR RATING REQUIREMENTS FOR PREMIUM EFFICIENCY, 460 VOLT, 3 PHASE HORIZONTAL AND VERTICAL MOTORS

		Protected (Open Drip Proof)(1)			Totally Enclosed Fan Cooled(1)		
Nominal Horsepower (Horsepower)	Syn. (revolutions per minute)	Minimum Efficiency (Percent)	Nominal Efficiency (Percent)	Power Factor (Percent)	Minimum Efficiency (Percent)	Nominal Efficiency (Percent)	Power Factor (Percent)
50	3,600	91.7	93.0	86.3	91.7	93.0	87.7
	1,800	93.0	94.1	83.3	93.0	94.1	84.2
	1,200	92.4	93.6	83.0	92.4	93.6	80.6
	900	92.4	93.6	79.2	91.7	93.0	79.5
60	3,600	92.4	93.6	88.8	92.4	93.6	88.9
	1,800	94.1	95.0	84.5	94.1	95.0	84.2
	1,200	93.6	94.5	84.4	93.0	94.1	85.4
	900	92.4	93.6	78.8	91.7	93.0	79.3
400	1800	95.4	96.2	90.1	93.4	94	88.4
	1200	96.3	96.7	86.5	95.2	95.5	80.3
	900	96.3	96.5	77.5	95.2	95.4	72.7

NOTES:

(1) Motor data for continuous duty, NEMA Design B, 1.15 service factor, 40 degrees Celsius ambient, Class F insulation, 3 phase, 460 volt, at listed speed rating.

(2) Correct to 95 percent power factor and submit capacitor size in KVAR as specified in Article titled "Submittals."

(3) Totally enclosed fan cooled efficiencies apply to both horizontal and vertical motors.

END OF SECTION

SECTION 16940
ELECTRICAL TESTING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Acceptance testing of electrical system, wiring, equipment, and grounding.

B. Related Sections:
1. 16000 – Requirements for Electrical Work.

1.2 REFERENCES

A. National Electrical Testing Association (NETA):
1. ATS-2021: Acceptance Testing Specifications for Electric Power Distribution Equipment and Systems.

B. ANSI: Test Procedures for Electrical Equipment.

C. ASTM: American Society for Testing and Materials.

D. ANSI/IEEE: Recommended Practices for Testing: Machinery, Ground Impedance, Cables and Terminations.

1.3 SUBMITTALS

A. Pre-Test Submittals:
1. Testing service qualifications.
2. Test personnel qualifications (resumes).
3. Equipment testing schedule.
4. Test data forms, custom edited for difference types of electrical equipment. Test forms shall be specific for the tested equipment, the Owner (City), and the location. Non-conformance forms shall be rejected.

B. Post-Test Submittals: Summary Test Report consists of the following:
1. Summary of testing for the project.
2. Description of the equipment tested.
3. Description of the test and test procedures.
4. Test results for each apparatus and motorized equipment.
5. Conclusions and recommendations.
6. Completed test forms, including tester’s and witness's signatures.
7. List of test equipment and calibration documents.
8. Date and time.
9. A copy of this specification section with each paragraph check marked indicating compliance or marked with explicit deviations.

C. Submit Equipment Testing Schedule no later than 7 days prior to scheduled date of testing.

D. Project Record Documents: Submit as specified in Section 16000. Note or indicate wiring deviations from Contract Documents on Project Record Documents.

1.4 QUALITY ASSURANCE

A. Testing Firm Qualifications:
   1. Obtain the services of an independent testing service firm that meets the Federal OSHA criteria for accreditation of testing laboratories, Title 29, Part 1910.7 and has a work history and qualifications acceptable to ENGINEER.
   2. Prequalified Testing Services and Manufacturing Firms:
      a. General Electric Company.
      b. Square D Company Technical Service Divisions.
      c. Electrical Reliability Services/Emerson
      d. Siemens/Westinghouse Technical Services.
   3. Testing service or testing personnel may be accepted or rejected based upon, but not limited to, the testing equipment intended to be used, the qualifications of the firm, and personnel.

B. Test Equipment Traceability:
   1. Testing firm shall have a calibration program to maintain test instrumentation and equipment within rated accuracy, including stickers with calibration dates record.
   2. Equipment and instruments used to evaluate electrical performance shall be calibrated to a standard traceable to the National Institute of Standards and Technology.
   3. Test equipment operating instructions and procedures shall be with the test equipment.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 SAFETY AND PRECAUTIONS

A. Testing firm shall perform tests following a safe practice in accordance with OSHA and accident prevention procedures by National Safety Council and applicable codes.

B. Tests shall be performed with apparatus de-energized, except as necessary for equipment performance and functional test.

3.2 EXAMINATION

A. Verify that electrical work is free from improper grounds, short circuits, and overloads.

B. Verify correctness of wiring first by visual comparison of the conductor connections with connection diagrams.

C. Make individual circuit continuity checks by using electrical circuit testers.

D. Verify correctness of wiring by actual electrical operation of electrical and mechanical devices in both manual and automatic modes of operation.

3.3 ACCEPTANCE TESTING

A. General Requirements:
1. Perform testing and allow CITY and ENGINEER to witness testing at their discretion.
2. Perform tests to assure that electrical equipment will operate within industry and manufacturer's published tolerances, and will perform safely. Record test result data, to be used as a baseline for future tests.
3. Test motorized equipment to verify conformance with the Contract Documents and for acceptance.
4. Equipment for which acceptable test data has not been submitted, or has been submitted but rejected, shall be deemed as not meeting Contract requirements.

B. Equipment and Materials Inspection and Test Procedures. Complete test reports for each individual piece of equipment and systems:

1. Motor Controllers and Motor Starters: Low Voltage
   a. Visual and Mechanical Inspection
      1) Compare equipment nameplate and data with drawings and specifications.
      2) Inspect physical and mechanical condition.
      3) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer’s published data.
   b. Electrical Tests
      1) Insulation Tests
         a) Measure insulation-resistance of each combination starter, phase-to-phase and phase-to-ground, with the starter contacts closed and the protective device open. Test voltage shall be in accordance with manufacturer’s instructions for devices with solid-state components.
         b) Test the motor overload relay elements by injecting primary current through the overload circuit and monitoring trip time of the overload element.

            Note: Test times for thermal trip units will, in general, be longer than manufacturer’s curve if single-pole testing is performed. Optionally test with all poles in series for time test and each pole separately for comparison. (Refer to NEMA ICS 2-1993, Part 4.)
   c. Test Values
      1) Bolt-torque levels shall be in accordance with data specified by manufacturer.

2) Insulation-resistance values.
3) Overload trip times shall be in accordance with manufacturer's published data.

d. Existing Motor Control Center Bus
1) Visual inspection only. Tests of existing MCC bus are not required.

2. Low-Voltage Cables: 600 Volt
a. Visual and Mechanical Inspection
1) Compare cable data with drawings and specifications.
2) Inspect exposed sections of cables for physical damage and correct connection in accordance with single-line diagram.
3) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data.
4) Inspect compression-applied connectors for correct cable match and indentation.
5) Verify cable color coding with applicable engineer's specifications and National Electrical Code standards.
b. Electrical Tests
1) Perform an insulation resistance test on all cables.

3. Systems Function Tests
a. Perform system function tests upon completion of equipment tests. It is the purpose of system function tests to prove the correct interaction of all sensing, processing, and action devices.
b. Develop test parameters for the purpose of evaluating performance of all integral components and their functioning as a complete unit within design requirements. Perform these tests.
c. Verify the correct operation of all interlock safety devices for fail-safe functions in addition to design function.
d. Verify the correct operation of all sensing devices, alarms, and indicating devices.

3.4 SUMMARY TEST REPORT

A. Upon completion of testing of all electrical equipment, submit summary test report in a 3-ring binder with proper tabs and table of contents for review and approval.

END OF SECTION

SECTION V

CONSTRUCTION AGREEMENT

CONSTRUCTION AGREEMENT

FY _____ Fund _____ Cost Center _____ Object Code _____ Project # _____ Amount $_____

For multi-year contracts or contracts with multiple accounts:

FY _____ Fund _____ Cost Center _____ Object Code _____ Project # _____ Amount $_____

FY _____ Fund _____ Cost Center _____ Object Code _____ Project # _____ Amount $_____

FY _____ Fund _____ Cost Center _____ Object Code _____ Project # _____ Amount $_____

THIS AGREEMENT is dated as of the _____ day of _____ in the year 20____, by
(city use only)

and between CITY OF PETALUMA (hereinafter called "CITY") and _____ (hereinafter called "CONTRACTOR").

CITY and CONTRACTOR, in consideration of the mutual covenants hereinafter set forth, agree as follows:

ARTICLE 1. WORK

CONTRACTOR shall complete the WORK as specified or indicated in the CITY'S Contract Documents entitled ECWRF Chemical System Upgrade.

ARTICLE 2. COMPLETION OF WORK

The WORK shall be completed to the satisfaction of CITY within 160 (_____) working days from the commencement date stated in the Notice to Proceed. In no event, however, shall the WORK to be performed under this contract be considered to be complete until all construction items called for on the drawings, and specifications have been completed and the contract price paid in full.

ARTICLE 3. LIQUIDATED DAMAGES

A. CITY and the CONTRACTOR recognize that time is of the essence of this Agreement and that the CITY will suffer financial loss if the WORK is not completed within the time specified in Article 2 herein, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. It is hereby understood and agreed that it is and will be difficult and/or impossible to ascertain and determine the actual damage which the CITY will sustain in the event of and by reason of the CONTRACTOR's failure to fully perform the WORK or to fully perform all of its contract obligations that have accrued by the time for completion as specified in Article 2 herein and/or as specified for completion of any scheduled operations or works described in the Special Provisions. It is, therefore, agreed in accordance with California Government Code Section 53069.85 that the CONTRACTOR will forfeit and pay to the CITY liquidated damages in the sum of one thousand and five hundred Dollars ($1,500.00) per day for each and every calendar day that expires after the time for completion specified in Article 2 herein and/or as specified for completion of any scheduled operations or works described in the Special Provisions except as otherwise provided by extension of time pursuant to Article 12 of the General

Conditions. It is further understood and agreed in accordance with California Government Code Section 53069.85 that the liquidated damages sum specified in this provision is not manifestly unreasonable under the circumstances existing at the time this contract was made, and that the CITY may deduct liquidated damages sums in accordance with this provision from any payments due or that may become due the CONTRACTOR.

B. Liquidated damages will continue to accrue at the stated rate until final completion of the WORK. Accrued liquidated damages may be deducted by the CITY from amounts due or that become due to the CONTRACTOR for performance of the WORK. Liquidated damages may not be waived or reduced by CITY unless expressly waived or reduced in writing by the ENGINEER.

ARTICLE 4. PREVAILING WAGES

A. Pursuant to California Labor Code Section 1771, CONTRACTOR and any subcontractor shall pay all workers employed in execution of the WORK in accordance with the general rate of per diem wages specified for each craft, classification, or type of worker needed to execute the WORK. Copies of the prevailing rates of per diem wages are on file at the City Clerk's office and shall be made available to any interested party on request.

B. CONTRACTOR is required to pay all applicable penalties and back wages in the event of violation of prevailing wage law, and CONTRACTOR and any subcontractor shall fully comply with California Labor Code Section 1775, which is incorporated by this reference as though fully set forth herein.

C. CONTRACTOR and any subcontractor shall maintain and make available for inspection payroll records as required by California Labor Code Section 1776, which is incorporated by this reference as though fully set forth herein. CONTRACTOR is responsible for ensuring compliance with this section. CONTRACTOR and any subcontractor shall maintain and make available for inspection payroll records as required by California Labor Code Section 1776, which is incorporated by this reference as though fully set forth herein. CONTRACTOR is responsible for ensuring compliance with this section. In addition, CONTRACTOR and any subcontractor shall submit certified payroll records to the Labor Commissioner online: http://www.dir.ca.gov/Public-Works/Certified-Payroll-Reporting.html.

D. CONTRACTOR and any subcontractor shall fully comply with California Labor Code Section 1777.5, concerning apprentices, which is incorporated by this reference as though fully set forth herein. CONTRACTOR is responsible for ensuring compliance with this section.

E. In accordance with California Labor Code Section 1810, eight (8) hours of labor in performance of the WORK shall constitute a legal day's work under this Agreement. CONTRACTOR and any subcontractor shall pay workers overtime pay as required by California Labor Code Section 1815. CONTRACTOR and any subcontractor shall, as a penalty to the CITY, forfeit Twenty-Five Dollars ($25) for each worker employed in the execution of the contract by the respective contractor or subcontractor for each calendar

day during which the worker is required or permitted to work more that 8 hours in any one calendar day and 40 hours in any one calendar week in violation so the provisions of Article 3 of Chapter 1 of Part 7, Division 2 of the California Labor Code, which is incorporated by this reference as though fully set forth herein.

ARTICLE 5. CONTRACT PRICE

A. CITY shall pay CONTRACTOR for completion of the WORK the sum of _____ Dollars ($_____), based on the bid price of same and in accordance with the Contract Documents.

B. Notwithstanding any provisions herein, CONTRACTOR shall not be paid any compensation until such time as CONTRACTOR has on file with the City Finance Department a current W-9 form available from the IRS website (www.irs.gov) and has obtained a currently valid Petaluma business license pursuant to the Petaluma Municipal Code.

C. In no case shall the total contract compensation exceed _____ Dollars ($_____) without the prior written authorization by the City Manager. Further, no compensation for a section or work program component attached with a specific budget shall be exceeded without the prior written authorization of the City Manager.

ARTICLE 6. BONDS

A. Before entering upon the performance of the WORK, the CONTRACTOR shall furnish Performance and Labor and Materials Bonds, each in the amount of one hundred percent (100%) of the contract price, as security for the faithful performance and payment of all the CONTRACTOR's obligations under the Contract Documents. These Bonds shall remain in effect at least until one year after the date of Completion, except as otherwise provided by Law or Regulation or by the Contract Documents. The CONTRACTOR shall also furnish such other Bonds as are required by the Supplementary General Conditions.

B. The CONTRACTOR shall guarantee the WORK to be free of defects in material and workmanship for a period of one (1) year following the CITY's acceptance of the WORK. The CONTRACTOR shall agree to make, at the CONTRACTOR's own expense, any repairs or replacements made necessary by defects in material or workmanship which become evident within the one-year guarantee period. The CONTRACTOR's guarantee against defects required by this provision shall be secured by a Maintenance Bond, in the amount of ten percent (10%) of the contract price, which shall be delivered by the CONTRACTOR to the CITY prior to acceptance of the WORK. The Maintenance Bond shall remain in force for one (1) year from the date of acceptance of the contracted WORK. The CONTRACTOR shall make all repairs and replacements within the time required during the guarantee period upon receipt of written order from the ENGINEER. If the CONTRACTOR fails to make the repairs and replacements within the required time, the CITY may do the work and the CONTRACTOR and the CONTRACTOR's surety for the Maintenance Bond shall be liable to the CITY for the cost. The expiration of the Maintenance Bond during the one-year guarantee period does not operate to waive or void the one-year guarantee, as set forth herein.

C. The form of the Performance, Labor and Materials, and Maintenance Bonds are provided by the CITY as part of the Contract Documents. Only such bond forms provided by the CITY are acceptable and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff, Bureau of Government Financial Operations, U.S. Treasury Department. All Bonds signed by an agent must be accompanied by a certified copy of such agent's authority to act.

D. If the surety on any Bond furnished by the CONTRACTOR is declared a bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the WORK is located, the CONTRACTOR shall within 7 days thereafter substitute another Bond and surety, which must be acceptable to the CITY.

E. All Bonds required by the Contract Documents to be purchased and maintained by CONTRACTOR shall be obtained from surety companies that are duly licensed or authorized in the State of California to issue Bonds for the limits so required. Such surety companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary General Conditions.

ARTICLE 7. PAYMENT PROCEDURES

CONTRACTOR shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by ENGINEER as provided in the General Conditions.

ARTICLE 8. RETENTION

A. Pursuant to Section 22300 of the California Public Contract Code, the CONTRACTOR may substitute securities for any money withheld by the CITY to ensure performance under the Contract. At the request and expense of the CONTRACTOR, securities equivalent to the amount withheld shall be deposited with the CITY or with a state or federally chartered bank in California as to the escrow agent, who shall return such securities to the CONTRACTOR upon satisfactory completion of the Contract.

B. Alternatively, the CONTRACTOR may request and the CITY shall make payment of retentions earned directly to the escrow agent at the expense of the CONTRACTOR. At the expense of the CONTRACTOR, the CONTRACTOR may direct the investment of the payments into securities and the CONTRACTOR shall receive the interest earned on the investments upon the same terms provided for in this section for securities deposited by the CONTRACTOR. The CONTRACTOR shall be responsible for paying all fees for the expenses incurred by the escrow account and all expenses of the CITY. These expenses and payment terms shall be determined by the CITY's Finance Director of his/her designee and the escrow agent. Upon satisfactory completion of the Contract, the CONTRACTOR shall receive from the escrow agent all securities, interest, and payments received by the escrow agent from the CITY, pursuant to the terms of this section. The CONTRACTOR shall pay to each subcontractor, not later than 20 days of receipt of the payment, the

respective amount of interest earned, net of costs attributed to retention withheld from each subcontractor, on the amount of retention withheld to ensure the performance of the CONTRACTOR.

C. Securities eligible for investment under Section 22300 shall be limited to those listed in Section 16430 of the Government Code and to bank or savings and loan certificates of deposit, interest-bearing demand deposit accounts, standby letters of credit, or any other security mutually agreed to by the CONTRACTOR and the CITY.

ARTICLE 9. CONTRACT DOCUMENTS

The Contract Documents which comprise the entire agreement between the CITY and the CONTRACTOR concerning the WORK consist of this Agreement and the following attachments to this Agreement:

- Notice Inviting Bids
- Instructions to Bidders
- Bid Forms including the Bid, Bid Schedule(s), Information Required of Bidder, Bid Bond, and all required certificates and affidavits
- Labor and Materials Bond
- Performance Bond
- Maintenance Bond
- General Conditions
- Supplementary General Conditions (if any)
- Specifications
- Special Provisions
- Drawings
- Federal Wage Rates dated _____ (if applicable)
- Form FHWA-1273 (if applicable)
- Addenda (if any)
- Change Orders which may be delivered or issued after Effective Date of the Agreement and are not attached hereto.

There are no Contract Documents other than those listed in this Article 9. The Contract Documents may only be amended by Change Order as provided in Paragraph 3.5 of the General Conditions.

ARTICLE 10. INSURANCE

The applicable insurance requirements, as approved by the City's Risk Manager, are set forth in **Exhibit B**, attached hereto and incorporated by reference herein. *[City use: check one.]*

ARTICLE 11. INDEMNIFICATION

A. CONTRACTOR shall indemnify, defend with counsel acceptable to CITY, and hold harmless to the full extent permitted by law, CITY and its officers, officials, employees, agents and volunteers from and against any and all alleged liability, loss, damage, claims, expenses and costs (including, without limitation, attorney fees and costs and fees of litigation) (collectively, "Liability") of every nature arising out of or in connection with CONTRACTOR's performance of the WORK or its failure to comply with any of its obligations contained in this Agreement, except such Liability caused by the active negligence, sole negligence or willful misconduct of the CITY. Such indemnification by the CONTRACTOR shall include, but not be limited to, the following:

1. Liability or claims resulting directly or indirectly from the negligence or carelessness of the CONTRACTOR, its subcontractors, employees, or agents in the performance of the WORK, or in guarding or maintaining the same, or from any improper materials, implements, or appliances used in its construction, or by or on account of any act or omission of the CONTRACTOR, its employees, or agents;
2. Liability or claims arising directly or indirectly from bodily injury, occupational sickness or disease, or death of the CONTRACTOR's, or Supplier's own employees, or agents engaged in the WORK resulting in actions brought by or on behalf of such employees against the CITY and/or the ENGINEER;
3. Liability or claims arising directly or indirectly from or based on the violation of any Laws or Regulations, whether by the CONTRACTOR, its subcontractors, employees, or agents;
4. Liability or claims arising directly or indirectly from the use or manufacture by the CONTRACTOR, its subcontractors, employees, or agents in the performance of this Agreement of any copyrighted or uncopyrighted composition, secret process, patented or unpatented invention, article, or appliance, unless otherwise specified stipulated in this Agreement;
5. Liability or claims arising directly or indirectly from the breach of any warranties, whether express or implied, made to the CITY or any other parties by the CONTRACTOR, its subcontractors, employees, or agents;
6. Liability or claims arising directly or indirectly from the willful misconduct of the CONTRACTOR, its subcontractors, employees, or agents;
7. Liability or claims arising directly or indirectly from any breach of the obligations assumed in this Agreement by the CONTRACTOR;
8. Liability or claims arising directly or indirectly from, relating to, or resulting from a hazardous condition created by the CONTRACTOR, Subcontractors, Suppliers, or any of their employees or agents, and;
9. Liability or claims arising directly, or indirectly, or consequentially out of any action, legal or equitable, brought against the CITY, the ENGINEER, their consultants, subconsultants, and the officers, directors, employees and agents of each or any of them, to the extent caused by the CONTRACTOR's use of any premises acquired by permits, rights of way, or easements, the Site, or any land or area contiguous thereto or its performance of the WORK thereon.

B. The CONTRACTOR shall reimburse the CITY for all costs and expenses, (including but not limited to fees and charges of engineers, architects, attorneys, and other professionals and court costs of appeal) incurred by said CITY in enforcing the provisions of this Paragraph.

C. The indemnification obligation under this Article 11 shall be in addition to, and shall not be limited in any way by any limitation on the amount or type of insurance carried by CONTRACTOR 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 workers' compensation acts, disability benefit acts, or other employee benefit acts. The CONTRACTOR's responsibility for such defense and indemnity obligations shall survive the termination or completion of this Agreement for the full period of time allowed by law.

D. Pursuant to California Public Contract Code Section 9201, City shall timely notify Contractor of receipt of any third-party claim relating to this Agreement.

ARTICLE 12. DISCLAIMER AND INDEMNITY CONCERNING LABOR CODE SECTION 6400

By executing this agreement the CONTRACTOR understands and agrees that with respect to the WORK, and notwithstanding any provision in this contract to the contrary, the CONTRACTOR, and/or its privities, including, without limitation, subcontractors, suppliers and other engaged by the CONTRACTOR in the performance of the WORK shall be "employers" for purposes of California Labor Code Section 6400 and related provisions of law, and that neither CITY nor its officials, officers, employees, agents, volunteers or consultants shall be "employers" pursuant to California Labor Code Section 6400 with respect to the performance of the WORK by the CONTRACTOR and/or its privities.

The CONTRACTOR shall take all responsibility for the WORK, shall bear all losses and damages directly or indirectly resulting to the CONTRACTOR, any subcontractors, the CITY, its officials, officers, employees, agents, volunteers and consultants, on account of the performance or character of the WORK, unforeseen difficulties, accidents, or occurrences of other causes predicated on active or passive negligence of the CONTRACTOR or of any subcontractor, including, without limitation, all losses, damages or penalties directly or indirectly resulting from exposure to hazards in performance of the WORK in violation of the California Labor Code. The CONTRACTOR shall indemnify, defend and hold harmless the CITY, its officials, officers, employees, agents, volunteers and consultants from and against any or all losses, liability, expense, claim costs (including costs of defense), suits, damages and penalties (including, without limitation, penalties pursuant to the California Labor Code) directly or indirectly resulting from exposure to hazards in performance of the WORK in violation of the California Labor Code, except such liability or costs caused by the active negligence, sole negligence or willful misconduct of the CITY.

ARTICLE 13. INDEPENDENT CONTRACTOR

It is understood and agreed that in the performance of this Agreement, CONTRACTOR (including its employees and agents) is acting in the capacity of an independent contractor, and not as an agent or employee of the CITY. CONTRACTOR has full control over the means and methods of performing said services and is solely responsible for its acts and omissions, including the acts and omissions of its employees and agents.

ARTICLE 14. SUBCONTRACTORS

CONTRACTOR must obtain the CITY's prior written consent for subcontracting any WORK pursuant to this Agreement. Any such subcontractor shall comply, to the extent applicable, with the terms and conditions of this Agreement. Any agreement between CONTRACTOR and a subcontractor pursuant to this Agreement shall provide that the subcontractor procure and maintain insurance coverage as required herein and which shall name CITY as an additional insured.

ARTICLE 15. COMPLIANCE WITH LAWS/NON-DISCRIMINATION

CONTRACTOR shall comply with all applicable local, state and federal laws, regulations and ordinances in the performance of this Agreement. CONTRACTOR shall not discriminate in the provision of service or in the employment of persons engaged in the performance of this Agreement on account of race, color, national origin, ancestry, religion, gender, marital status, sexual orientation, age, physical or mental disability in violation of any applicable local, state or federal laws or regulations.

ARTICLE 16. NOTICES

All notices required or permitted by this Agreement, including notice of change of address, shall be in writing and given by personal delivery or sent postage prepaid and addressed to the parties intended to be notified, as set forth herein. Notice shall be deemed given as of the date of delivery in person or as of the date deposited in any post office or post office box regularly maintained by the United States Postal Service, unless otherwise stated herein. Notice shall be given as follows:

CITY:

City Clerk
City of Petaluma
Post Office Box 61
Petaluma, California 94953
Telephone: (707) 778-4360

CONTRACTOR:

_____
(Contact Name)

_____
(Business Name)

_____
(Address)

_____
(City, State, Zip)

_____
(Telephone)

_____
(E-mail)

ARTICLE 17. GOVERNING LAW/VENUE

This Agreement shall be construed and its performance enforced under California law. Venue shall be in the Superior Court of the State of California in the County of Sonoma.

ARTICLE 18. NON-WAIVER

The CITY's failure to enforce any provision of this Agreement or the waiver of any provision in a particular instance shall not be construed as a general waiver of any part of such provision. The provision shall remain in full force and effect.

ARTICLE 19. THIRD PARTY BENEFICIARIES

The Parties do not intend, by any provision of this Agreement, to create in any third party any benefit or right owed by one party, under the terms and conditions of this Agreement, to the other party.

ARTICLE 20. ASSIGNMENT

No assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and specifically but without limitation monies that may become due and monies that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

CITY and CONTRACTOR each binds itself, its partners, successors, assigns and legal representatives to the other party hereto, its partners, successors, assigns and legal representatives in respect of all covenants, agreements and obligations contained in the Contract Documents.

ARTICLE 21. SEVERABILITY

If any term or portion of this Agreement is held to be invalid, illegal, or otherwise enforceable by a court of competent jurisdiction, the remaining provisions of this Agreement shall continue in full force and effect.

IN WITNESS WHEREOF, CITY and CONTRACTOR have caused this Agreement to be executed the day and year first above written.

CITY

_____
City Manager

CONTRACTOR _____

By_____
(CORPORATE SEAL)

ATTEST:

_____
City Clerk

APPROVED AS TO FORM:

_____
City Attorney

Attest:_____

Address for giving notices:

_____

_____

Agent for service of process:

_____

_____

_____

_____
License Number

_____
Taxpayer I.D. Number

_____
Petaluma Business Tax Certificate Number

file name:

END OF AGREEMENT

AGREEMENT CERTIFICATE
(if Corporation)

STATE OF CALIFORNIA)
) ss:
COUNTY OF)

I HEREBY CERTIFY that a meeting of the Board of Directors of the _____ _____ a corporation existing under the laws of the State of _____, held on _____, 20____, the following resolution was duly passed and adopted:

"RESOLVED, that _____, as _____ President of the Corporation, be and is hereby authorized to execute the Agreement dated _____, 20____, by and between this Corporation and _____ and that his/her execution thereof, attested by the Secretary of the Corporation, and with the Corporate Seal affixed, shall be the official act and deed of this Corporation."

I further certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the official seal of the corporation this _____, day of _____, 20____.

_____
Secretary

(SEAL)

AGREEMENT CERTIFICATE
(if Partnership)

STATE OF CALIFORNIA)
) ss:
COUNTY OF)

I HEREBY CERTIFY that a meeting of the Partners of the _____
_____
a partnership existing under the laws of the State of _____, held on _____, 20____, the following resolution was duly passed and adopted:

"RESOLVED, that _____, as the General Partner of the Partnership, be and is hereby authorized to execute the Agreement dated _____, 20___, by and between this Partnership and _____ and that his/her execution thereof, attested by the _____ shall be the official act and deed of this Partnership."

I further certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand this _____ day of _____, 20___.

_____
Partner

(SEAL)

AGREEMENT CERTIFICATE
(if Joint Venture)

STATE OF CALIFORNIA)
) ss:
COUNTY OF)

I HEREBY CERTIFY that a meeting of the Principals of the _____
_____
_____ a
joint venture existing under the laws of the State of _____, held on _____, 20___, the following resolution was duly passed and adopted:

"RESOLVED, that _____, as_____, of the joint venture, be and is hereby authorized to execute the Agreement dated _____, 20___, by and between this Joint Venture and _____ and that his/her execution thereof, attested by the _____ shall be the official act and deed of this Joint Venture."

I further certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand this _____, day of _____, 20___.

_____
Managing Partner

(SEAL)

EXHIBIT B
INSURANCE REQUIREMENTS - Construction

Contractor's performance of the Services under this Agreement shall not commence until Contractor shall have obtained all insurance required under this paragraph and such insurance shall have been approved by the City Attorney as to form and the Risk Manager as to carrier and sufficiency. All requirements herein provided shall appear either in the body of the insurance policies or as endorsements and shall specifically bind the insurance carrier.

Contractor shall procure and maintain for the duration of the contract, and for 5 years thereafter, insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the work hereunder by the Contractor, his agents, representatives, employees, or subcontractors.

A. MINIMUM SCOOE AND LIMIT OF INSURANCE

Coverage shall be at least as broad as:

1. Commercial General Liability (CGL): Insurance Services Office (ISO) Form CG 00 01 covering CGL on an "occurrence" basis, including products and completed operations, property damage, bodily injury and personal & advertising injury with limits no less than $5,000,000 per occurrence. If a general aggregate limit applies, either the general aggregate limit shall apply separately to this project/location (ISO CG 25 03 or 25 04) or the general aggregate limit shall be twice the required occurrence limit.
2. Automobile Liability: Insurance Services Office Form CA 0001 covering Code 1 (any auto), with limits no less than $5,000,000 per accident for bodily injury and property damage.
3. Workers' Compensation insurance as required by the State of California, with Statutory Limits, and Employers' Liability insurance with a limit of no less than $1,000,000 per accident for bodily injury or disease.
4. Builder's Risk (Course of Construction) insurance utilizing an "All Risk" (Special Perils) coverage form, with limits equal to the completed value of the project and no coinsurance penalty provisions.

☒ Surety Bonds as described below.

☐ Professional Liability (if Design/Build), with limits no less than $2,000,000 per occurrence or claim, and $2,000,000 policy aggregate.

☒ Contractors' Pollution Legal Liability and/or Errors and Omissions with limits no less than $1,000,000 per occurrence or claim, and $2,000,000 policy aggregate.

5. If the contractor maintains broader coverage and/or higher limits than the minimums shown above, the City requires and shall be entitled to the broader coverage and/or the higher limits maintained by the contractor. Any available

insurance proceeds in excess of the specified minimum limits of insurance and coverage shall be available to the City.

B. Self-Insured Retentions

Self-insured retentions must be declared to and approved by the City. The City may require the Contractor to purchase coverage with a lower retention or provide proof of ability to pay losses and related investigations, claim administration, and defense expenses within the retention. The policy language shall provide, or be endorsed to provide, that the self-insured retention may be satisfied by either the named insured or City. The CGL and any policies, including Excess liability policies, may not be subject to a self-insured retention (SIR) or deductible that exceeds $25,000 unless approved in writing by City. Any and all deductibles and SIRs shall be the sole responsibility of Contractor or subcontractor who procured such insurance and shall not apply to the Indemnified Additional Insured Parties. City may deduct from any amounts otherwise due Contractor to fund the SIR/deductible. Policies shall NOT contain any self-insured retention (SIR) provision that limits the satisfaction of the SIR to the Named Insured. The policy must also provide that Defense costs, including the Allocated Loss Adjustment Expenses, will satisfy the SIR or deductible. City reserves the right to obtain a copy of any policies and endorsements for verification.

C. Other Insurance Provisions

The insurance policies are to contain, or be endorsed to contain, the following provisions:

1. The City, its officers, officials, employees, and volunteers are to be covered as additional insureds on the CGL policy with respect to liability arising out of work or operations performed by or on behalf of the Contractor including materials, parts, or equipment furnished in connection with such work or operations and automobiles owned, leased, hired, or borrowed by or on behalf of the Contractor. General liability coverage can be provided in the form of an endorsement to the Contractor's insurance (at least as broad as ISO Form CG 20 10, CG 11 85 or both CG 20 10, CG 20 26, CG 20 33, or CG 20 38; and CG 20 37 forms if later revisions used).
2. For any claims related to this project, the Contractor's insurance coverage shall be primary and non-contributory insurance coverage at least as broad as ISO CG 20 01 04 13 as respects the City, its officers, officials, employees, and volunteers. Any insurance or self-insurance maintained by the City, its officers, officials, employees, or volunteers shall be excess of the Contractor's insurance and shall not contribute with it. This requirement shall also apply to any Excess or Umbrella liability policies.
3. Each insurance policy required by this clause shall provide that coverage shall not be canceled, except with notice to the City.

D. Builder's Risk (Course of Construction) Insurance

Contractor may submit evidence of Builder's Risk insurance in the form of Course of Construction coverage. Such coverage shall name the City as a loss payee as their interest may appear. If the project does not involve new or major reconstruction, at the option of the City, an Installation Floater may be acceptable. For such projects, a Property Installation Floater shall be obtained that provides for the improvement, remodel, modification, alteration, conversion or adjustment to existing buildings, structures, processes, machinery and equipment. The Property Installation Floater shall provide property damage coverage for any building, structure, machinery or equipment damaged, impaired, broken, or destroyed during the performance of the Work, including during transit, installation, and testing at the City's site.

E. Claims Made Policies

If any coverage required is written on a claims-made coverage form:

1. The retroactive date must be shown, and this date must be before the execution date of the contract or the beginning of contract work.
2. Insurance must be maintained, and evidence of insurance must be provided for at least five (5) years after completion of contract work.
3. If coverage is cancelled or non-renewed, and not replaced with another claims-made policy form with a retroactive date prior to the contract effective, or start of work date, the Contractor must purchase extended reporting period coverage for a minimum of five (5) years after completion of contract work.
4. A copy of the claims reporting requirements must be submitted to the City for review.
5. If the services involve lead-based paint or asbestos identification/remediation, the Contractors Pollution Liability policy shall not contain lead-based paint or asbestos exclusions. If the services involve mold identification/remediation, the Contractors Pollution Liability policy shall not contain a mold exclusion, and the definition of Pollution shall include microbial matter, including mold.

F. Umbrella or Excess Policies

The Contractor may use Umbrella or Excess Policies to provide the liability limits as required in this agreement. This form of insurance will be acceptable provided that all of the Primary and Umbrella or Excess Policies shall provide all of the insurance coverages herein required, including, but not limited to, primary and non-contributory, additional insured, Self-Insured Retentions (SIRs), indemnity, and defense requirements. The Umbrella or Excess policies shall be provided on a true "following form" or broader coverage basis, with coverage at least as broad as provided on the underlying Commercial General Liability insurance. No insurance policies maintained by the Additional Insureds, whether primary or excess, and which also apply to a loss covered hereunder, shall be called upon to contribute to a loss until the Contractor's primary and excess liability policies are exhausted.

G. Acceptability of Insurers

Insurance is to be placed with insurers authorized to conduct business in the state with a current A.M. Best rating of no less than A: VII, unless otherwise acceptable to the City.

H. Waiver of Subrogation

Contractor hereby agrees to waive rights of subrogation which any insurer of Contractor may acquire from Contractor by virtue of the payment of any loss. Contractor agrees to obtain any endorsement that may be necessary to affect this waiver of subrogation. The Workers' Compensation policy shall be endorsed with a waiver of subrogation in favor of the City for all work performed by the Contractor, its employees, agents and subcontractors.

I. Verification of Coverage

Contractor shall furnish the City with original certificates and amendatory endorsements or copies of the applicable policy language effecting coverage required by this clause and a copy of the Declarations and Endorsements Pages of the CGL and any Excess policies listing all policy endorsements. All certificates and endorsements and copies of the Declarations & Endorsements pages are to be received and approved by the City before work commences. However, failure to obtain the required documents prior to the work beginning shall not waive the Contractor's obligation to provide them. The City reserves the right to require complete, certified copies of all required insurance policies, including endorsements required by these specifications, at any time. **NOTE: The City of Petaluma is now using an online insurance program, PINS Advantage. Once you have been awarded a contract with the City of Petaluma, you will receive an e-mail from PINS Advantage/City of Petaluma requesting that you forward the e-mail to your insurance agent(s).**

J. Subcontractors

Contractor shall require and verify that all subcontractors maintain insurance meeting all requirements stated herein, and Contractor shall ensure that City is an additional insured on insurance required from subcontractors. For CGL coverage, subcontractors shall provide coverage with a form at least as broad as CG 20 38 04 13.

K. Duration of Coverage

CGL & Excess liability policies for any construction related work, including, but not limited to, maintenance, service, or repair work, shall continue coverage for a minimum of 5 years for Completed Operations liability coverage. Such Insurance must be maintained and evidence of insurance must be provided for at least five (5) years after completion of the contract of work.

L. Surety Bonds

Contractor shall provide the following Surety Bonds:

1. Bid Bond
2. Performance Bond
3. Payment Bond
4. Maintenance Bond

The Payment Bond and the Performance Bond shall be in a sum equal to the contract price. If the Performance Bond provides for a one-year warranty a separate Maintenance Bond is not necessary. If the warranty period specified in the contract is for longer than one year a Maintenance Bond equal to 10% of the contract price is required. Bonds shall be duly executed by a responsible corporate surety, authorized to issue such bonds in the State of California and secured through an authorized agent with an office in California.

M. Special Risks or Circumstances

City reserves the right to modify these requirements, including limits, based on the nature of the risk, prior experience, insurer, coverage, or other circumstances.

FAITHFUL PERFORMANCE BOND

WHEREAS, the City Council of the City of Petaluma, State of California, and _____ (hereinafter designated as "Principal") have entered into an agreement whereby Principal agrees to install and complete certain designated public improvements, which said agreement, dated _____, 20_____, and identified as project _____, is hereby referred to and made a part hereof; and,

WHEREAS, said Principal is required under the terms of said agreement to furnish a bond for the faithful performance of said agreement.

NOW, THEREFORE, WE, the Principal and _____, duly authorized to transact business under the laws of the State of California, as Surety, are held and firmly bound unto the City of Petaluma, hereinafter called "City," in the penal sum of _____ Dollars ($_____) lawful money of the United States, for payment of which sum well and truly to be made, we bind ourselves, our heirs, successors, executors, and administrators, jointly and severally, firmly by these present. The conditions of this obligation are such that if the above-bound Principal, the Principal's heirs, executors, administrators, successors or assigns, shall in all things stand to and abide by, and well and truly keep and perform the covenants, conditions and provisions in the said agreement and any alteration thereof made as therein provided, on his or their part, to be kept and performed at the time and in the manner therein specified, and in all respects according to their true intent and meaning, and shall indemnify and save harmless the City of Petaluma, its officers, agents, employees, and volunteers, as therein stipulated, then this obligation shall become null and void; otherwise it shall be and remain in full force and effect.

As a part of this obligation secured hereby and in addition to the face amount specified therefore, there shall be included costs and reasonable expenses and fees, including reasonable attorney's fees, incurred by the City in successfully enforcing such obligation, all to be taxed as costs and included in any judgment rendered.

The Surety hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of this agreement or to the work to be performed thereunder or the specifications accompanying the same shall in anywise affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the agreement or to the work or to the specifications.

And the said Surety, for value received, hereby stipulates and agrees that upon termination of the Contract for cause, the Obligee reserves the right to refuse tender of the Principal by the Surety to complete the Contract work.

IN WITNESS WHEREOF, this instrument has been duly executed by the Principal and Surety above named, on _____, 20_____.

PRINCIPAL	SURETY
By_____	By_____
_____	_____
Name and Title	Name and Title
	_____
	Address
	_____
	City State Zip
	_____
	Phone Number

# # #

NOTE: No substitution or revision to this bond form will be accepted. Be sure that all bonds submitted have a certified copy of the bonding agent's power of attorney attached. Also verify that Surety is an "Admitted Surety" (i.e., qualified to do business in California), and attach proof of verification (website printout from the California Department of Insurance website (http://www.insurance.ca.gov/docs/index.html) or certificate from County Clerk).

APPROVED AS TO AMOUNT:	APPROVED AS TO FORM:
_____	_____
City Manager	City Attorney

END OF FAITHFUL PERFORMANCE BOND

LABOR AND MATERIALS BOND

WHEREAS, the City of Petaluma, State of California, and _____ (hereinafter designated as "Principal") have entered into an agreement whereby the Principal agrees to install and complete certain designated public improvements, which said agreements, dated _____, 20_____, and identified as project _____, is hereby referred to and made a part hereof; and,

WHEREAS, under the terms of said agreement Principal is required before entering upon the performance of the work, to file a good and sufficient payment bond with the City of Petaluma, to secure the claims to which reference is made in Title 15 (commencing with Section 3082) of Part 4 of Division 3 of the Civil Code of the State of California.

NOW, THEREFORE, said Principal and the undersigned, duly authorized to transact business under the laws of the State of California, as corporate surety, are held firmly bound unto the City of Petaluma, and all contractors, subcontractors, laborers, materialmen and other persons employed in the performance of the aforesaid agreement and referred to in the aforesaid Civil Code of the State of California, in the sum of _____ Dollars ($_____) for materials furnished or labor thereon of any kind, or for amounts due under the Unemployment Insurance Act with respect to such work or labor, that said surety will pay the same in an amount not exceeding the amount hereinabove set forth, and also in case suit is brought upon this bond, will pay, in addition to the face amount thereof, costs and reasonable expenses and fees, including reasonable attorney's fees, incurred by City in successfully enforcing such obligation, to be awarded and fixed by the Court, and to be taxed as costs and to be included in the judgment therein rendered.

It is hereby expressly stipulated and agreed that this bond shall inure to the benefit of any and all persons, companies and corporations entitled to file claims under Title 15 (commencing with section 3082) of Part 4 of Division 3 of the Civil Code, so as to give a right of action to them or their assigns in any suit brought upon this bond.

Should the condition of this bond be fully performed, then this obligation shall become null and void, otherwise it shall be and remain in full force and effect.

THE SURETY hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of said agreement or the specifications accompanying the same shall in any

manner affect its obligations on this bond, and it does hereby waive notice of any such change, extension, alteration or addition.

IN WITNESS WHEREOF, this instrument has been duly executed by the Principal and surety above named, on _____, 20_____.

PRINCIPAL	SURETY
By_____	By_____
_____	_____
Name and Title	Name and Title
	_____
	Address
	_____
	City State Zip
	_____
	Phone

# # #

NOTE: No substitution or revision to this bond form will be accepted. Be sure that all bonds submitted have a certified copy of the bonding agent's power of attorney attached. Also verify that Surety is an "Admitted Surety" (i.e., qualified to do business in California), and attach proof of verification (website printout from the California Department of Insurance website (http://www.insurance.ca.gov/docs/index.html) or certificate from County Clerk)..

APPROVED AS TO AMOUNT:	APPROVED AS TO FORM:
_____	_____
City Manager	City Attorney

END OF LABOR AND MATERIALS BOND

MAINTENANCE BOND

WHEREAS, the City Council of the City of Petaluma ("City") and _____, (hereinafter designated as "Principal") have entered into an agreement whereby Principal agrees to install and complete certain designated public improvements, which said agreement, dated _____, 20_____, and identified as project _____, is hereby referred to and made a part hereof; and,

WHEREAS, said Principal is required under the terms of said contract to furnish a maintenance bond for the correction of any defects due to defective materials or workmanship in the work performed under said agreement.

NOW, THEREFORE, we the Principal and _____ as Surety, are held and firmly bound unto the City of Petaluma in the penal sum of _____ Dollars ($_____), lawful money of the United States for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns jointly and severally, firmly by these presents.

THE CONDITIONS OF THIS OBLIGATION ARE SUCH that if, during a maintenance period of one (1) year from the date of acceptance of the contracted work, the Principal upon receiving written notice of a need for repairs which are directly attributable to defective materials or workmanship, shall diligently take the necessary steps to correct said defects within seven (7) days from the date of said notice, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

As part of this obligation secured hereby and in addition to the face amount specified therefor, there shall be included costs and reasonable expenses and fees, including reasonable attorney's fees, incurred by the City in successfully enforcing such obligation, all to be taxed as costs and included in any judgment rendered.

The Surety hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of this agreement or to the work to be performed thereunder or the specifications accompanying the same shall in anywise affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the agreement or to the work or to the specifications.

IN WITNESS WHEREOF, this instrument has been duly executed by the Principal and Surety above named, on _____, 20_____.

PRINCIPAL

By_____

_____
Name and Title

SURETY

By_____

_____
Name and Title

_____
Address

_____
City State Zip

_____
Phone Number

# # #

NOTE: No substitution or revision to this bond form will be accepted. Be sure that all bonds submitted have a certified copy of the bonding agent's power of attorney attached. Also verify that Surety is an "Admitted Surety" (i.e., qualified to do business in California), and attach proof of verification (website printout from the California Department of Insurance website (http://www.insurance.ca.gov/docs/index.html) or certificate from County Clerk).

APPROVED AS TO AMOUNT:

_____
City Manager

APPROVED AS TO FORM:

_____
City Attorney

END OF MAINTENANCE BOND

NOTARIAL ACKNOWLEDGEMENT OF ATTORNEY-IN-FACT OF SURETY

STATE OF CALIFORNIA)
) SS.
COUNTY OF SONOMA)

On _____ before me, a Notary Public, personally appeared _____, personally known to me (or proved to me on the basis of satisfactory evidence) to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

WITNESS my hand and official seal.

_____
Notary Public

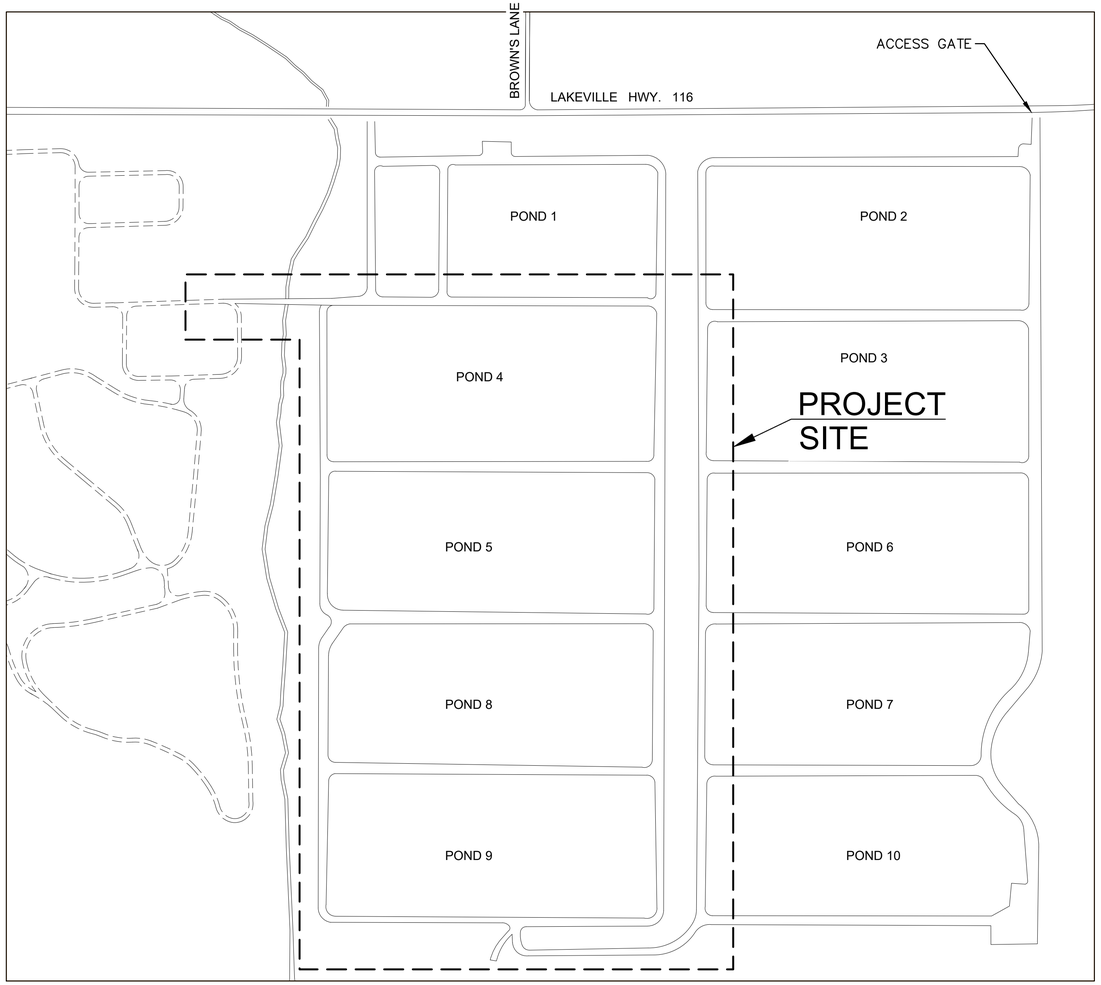
(Seal)

SECTION VI

PROJECT PLANS

City of Petaluma, California

ELLIS CREEK WATER RECYCLING FACILITY
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
LAKEVILLE HWY (116) AT BROWNS LANE



LOCATION MAP
SCALE: N.T.S.

MAYOR
Kevin McDonnell

VICE MAYOR
John Shribbs

COUNCIL MEMBERS
Brian Barnacle
Mike Healy
Karen Nau
Dennis Pocekay
Janice Cader Thompson

CITY MANAGER
Peggy Flynn

DIRECTOR OF PUBLIC WORKS & UTILITIES
Christopher Bolt, P.E.

	SIGNATURE	DATE
CITY ENGINEER		
ENGINEERING MANAGER		
FIRE MARSHAL		
PARKS		
PLANNING		
POLICE		
UTILITY MANAGER		

RECORD PLAN

I _____ HEREBY STATE THAT THESE RECORD PLAN CHANGES ARE COMPLETE FROM INFORMATION FURNISHED BY THE PROJECT CONTRACTOR, SOILS ENGINEER AND MY OFFICE. I HEREBY STATE THAT TO THE BEST OF MY KNOWLEDGE THE THE WORK WAS DONE IN ACCORDANCE WITH THE FINAL APPROVED PLANS. THE ENGINEER AND THE CITY WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THIS DOCUMENT AS A RESULT. FIELD VERIFICATION OF CRITICAL FACTS AND DATA SHOULD BE MADE IF THESE DOCUMENTS ARE TO BE USED AS A BASIS FOR FUTURE WORK. ENGINEER'S SIGNATURE _____ DATE: _____

☐ ALL PROJECT PLANS HAVE BEEN PREPARED AND REVIEWED TO COMPLY WITH CURRENT AMERICANS WITH DISABILITIES ACT (ADA) REQUIREMENTS AND/OR THE CALIFORNIA BUILDING STANDARDS CODE (CBSC).

☐ THESE PROJECT PLANS CONTAIN ELEMENT(S) THAT ARE NOT "TECHNICALLY FEASIBLE" AND/OR CAN'T MEET THE APPLICABLE CBSC BECAUSE IT WOULD CREATE AN "UNREASONABLE HARDSHIP." PLEASE SEE THE WRITTEN ANALYSIS SUPPORTING THIS DETERMINATION FILED UNDER THE PROJECT FILE.

DESIGNED BY

_____
SIGNATURE DATE

APPROVED BY:

_____
XXXXXXX XXXXXXXXX P.E. CXXXXX
(Title)

DESIGNED BY:

_____
XXXXX XXXXXXXX P.E. CXXXXX
(Title)

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024
DESIGNED BY: A. HESS
DRAWN BY: N. HUNTER
CHECKED BY: M. METTS

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
DAVID MICHAEL METTS
No. 42588
CIVIL
STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
GENERAL
TITLE SHEET AND LOCATION MAP

SHEET
G-1

1 OF 55

34"x22" ORIGINAL SCALE IN INCHES

P:\101 Engineering\Petaluma, City of\15219_ECWRF Chemical System Upgrade\6-CAD\15219 SH01-03 G-1 to G-3.dwg 04/30/2024 09:10

GENERAL NOTES

1. CONTRACTOR SHALL FIELD VERIFY THE HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UTILITIES BY POT-HOLING OR OTHER DIRECT INSPECTION METHOD PRIOR TO COMMENCING WORK.
2. UNDERGROUND UTILITIES MAY NOT BE SHOWN ON THE PLANS AND MUST BE LOCATED BY THE CONTRACTOR PRIOR TO START OF PROPOSED WORK.
3. ALL FRAMES AND COVERS MUST BE ADJUSTED TO FINISH GRADE WITHIN 2 DAYS AFTER FINAL PAVING.
4. THE CONTRACTOR SHALL NOTE ALL APPROVED FIELD CHANGES AND OTHER OCCURRENCES AND SUBMIT A FULL SIZE COMPLETE CONSTRUCTION "RECORD DRAWING" SET NOTED AND DATED ON THE DRAWINGS TO THE OWNER PRIOR TO ACCEPTANCE OF THE WORK.
5. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE ALL MATERIAL AND WORKMANSHIP FULLY CONFORMS TO THE SPECIFICATIONS, STANDARDS AND ORDINANCES OF THE CITY OF PETALUMA.
6. ALL EROSION AND SEDIMENT CONTROL MATERIALS AND METHODS SHALL COMPLY WITH THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, SAN FRANCISCO BAY REGION, EROSION AND SEDIMENT CONTROL MANUAL.
7. THE CONTRACTOR SHALL CONTACT UNDERGROUND SERVICE ALERT (USA) AND VERIFY UTILITY MARKINGS PRIOR TO ANY EXCAVATION. 1-800-227-2600.
8. FOR BOTH BELOW GRADE AND ABOVE GRADE INSTALLATIONS 1W AND 3W SPACING MUST COMPLY WITH CALIFORNIA PLUMBING CODE, INCLUDING SPACING BETWEEN WATER LINES AND WASTEWATER TREATMENT PLANT EQUIPMENT AND PONDS.
9. EARTHWORK FOR THIS PROJECT IS TO BE PERFORMED PER THE DRAWINGS, SPECIFICATIONS, AND RECOMMENDATIONS CONTAINED IN THE GEOTECHNICAL REPORT ENTITLED "GEOTECHNICAL INVESTIGATION, CHEMICAL SYSTEM UPGRADE, ELLIS CREEK WATER RECYCLING FACILITY, PETALUMA, CA", DATED JUNE 27, 2023 PREPARED BY BSK ASSOCIATES. IN CASE OF A CONFLICT BETWEEN THE EARTHOWRK REQUIREMENTS PRESENTED IN THE GEOTECHNICAL REPORT AND THE DRAWINGS AND SPECIFICATIONS, THE GEOTECHNICAL REPORT SHALL PREVAIL UNLESS OTHERWISE INDICATED BY THE ENGINEER OR GEOTECHNICAL ENGINEER.

ABBREVIATIONS

AB	AGGREGATE BASE
ABND	ABANDONED
AC	ASPHALTIC CONCRETE
ACP	ASBESTOS CEMENT PIPE
BC	BEGIN CURVE
CDF	CONTROL DENSITY FILL
CI	CAST IRON
CIPP	CURED IN PLACE PIPE
CL	CENTERLINE
CO	CLEAN OUT
CR	CURB RETURN
DIP	DUCTILE IRON PIPE
EC	END CURVE
EG	EXISTING GRADE
EL	ELEVATION
ELEC	ELECTRIC
EP	EDGE OF PAVEMENT
EX	EXISTING
FA	FOUL AIR
FC	FACE OF CURB
FDC	FIRE DEPT CONNECTION
FG	FINISH GRADE
FH	FIRE HYDRANT
FL	FLOW LINE
FO	FIBER OPTIC CABLE
G	GAS
HCS	HYPOCHLORITE SOLUTION
HDPE	HIGH DENSITY POLYETHYLENE
HWE	HEADWORKS EFFLUENT
HWO	HEADWORKS OVERFLOW
INV	INVERT
IRR	IRRIGATION
JT	JOINT TRENCH
LG	LIP OF GUTTER
NG	NATURAL GAS
MH	MANHOLE
MON	MONUMENT
PCC	PORTLAND CEMENT CONCRETE
PL	PLASTIC
PVC	POLYVINYL CHLORIDE
R	RADIUS
RC	RELATIVE COMPACTION
RCP	REINFORCED CONCRETE PIPE
SS	SANITARY SEWER
SQFT	SQUARE FEET
STA	STATION
STL	STEEL
SD	STORM DRAIN
SE	SECONDARY EFFLUENT
SL	STREET LIGHT
TEL	TELEPHONE
TC	TOP OF CURB
TP	TOP OF PIPE
TPE	TERTIARY PLANT EFFLUENT
TV	TV CABLE
TWE	TREATMENT WETLANDS EFFLUENT
TYP	TYPICAL
URW	URBAN RECYCLED WATER
UTILP	UTILITY POLE
VCP	VITRIFIED CLAY PIPE
W	WATER
WEPS	WETLANDS EFFLUENT PUMP STATION
WS	WATER SERVICE
WSP	WELDED STEEL PIPE

NOTE :

1. FOR PIPING SERVICE ABBREVIATIONS SEE DRAWING M-1.

DRAWING LIST

GENERAL

1	G-1	TITLE SHEET AND LOCATION MAP
2	G-2	GENERAL NOTES, ABBREVIATIONS AND DRAWING LIST
3	G-3	DESIGN CRITERIA, SYMBOLS AND SCHEDULE
4	G-4	OVERALL SITE PLAN AND HORIZONTAL CONTROL

DEMOLITION

5	D-1	WETLANDS PUMP STATION PLAN AND SECTION

CIVIL

6	C-1	KEY MAP
7	C-2	GRADING AND PAVING PLAN - 1
8	C-3	GRADING AND PAVING PLAN - 2
9	C-4	GRADING AND PAVING PLAN - 3
10	C-5	GRADING AND PAVING PLAN - 4
11	C-6	CHEMICAL STORAGE AREA SITE PLAN
12	C-7	YARD PIPING PLAN - 1
13	C-8	YARD PIPING PLAN - 2
14	C-9	YARD PIPING PLAN - 3
15	C-10	YARD PIPING PLAN - 4
16	C-11	PIPE BRIDGE CROSSING - 1
17	C-12	PIPE BRIDGE CROSSING - 2
18	C-13	ACCESS ROAD SECTIONS AND DETAILS
19	C-14	1W AND 3W POINT OF CONNECTION DETAILS
20	C-15	DETAILS - 1
21	C-16	DETAILS - 2

STRUCTURAL

22	S-1	GENERAL NOTES - 1
23	S-2	GENERAL NOTES - 2
24	S-3	GENERAL NOTES - 3
25	S-4	TYPICAL DETAILS - 1
26	S-5	TYPICAL DETAILS - 2
27	S-6	TYPICAL DETAILS - 3
28	S-7	CHEMICAL STORAGE AREA FOUNDATION PLAN
29	S-8	CHEMICAL STORAGE AREA SECTIONS
30	S-9	DETAILS - 1
31	S-10	DETAILS - 2

MECHANICAL

32	M-1	MECHANICAL GENERAL NOTES AND SYMBOLS
33	M-2	WEPS AND CHEMICAL STORAGE AREA SITE PLAN
34	M-3	CHEMICAL STORAGE AREA PLAN
35	M-4	CHEMICAL STORAGE AREA SECTION AND DETAILS
36	M-5	CHEMICAL FEED SYSTEM SCHEMATIC
37	M-6	WETLANDS PUMP STATION PLAN AND SECTION
38	M-7	TOTAL CHLORINE ANALYZER DETAILS
39	M-8	DETAILS - 1

ELECTRICAL

40	E-1	LEGEND AND NOTES
41	E-2	SINGLE LINE DIAGRAMS
42	E-3	CONTROL ONE LINE DIAGRAM
43	E-4	PUMP STATION CHEMICAL AREA PLAN
44	E-5	CONTROL SCHEMATIC DIAGRAMS
45	E-6	CONSTRUCTION DETAILS - SHEET 1
46	E-7	CONSTRUCTION DETAILS - SHEET 2
47	E-8	CONSTRUCTION DETAILS - SHEET 3
48	E-9	TYPICAL DETAILS
49	E-10	LIGHTING IMPROVEMENT SHEET 1
50	E-11	LIGHTING IMPROVEMENT SHEET 2
51	E-12	SAMPLE PUMP CONTROL SCHEMATIC DIAGRAM

P&ID

52	I-1	P&ID LEGEND AND NOTES
53	I-2	P&ID CHEMICAL SYSTEMS
54	I-3	P&ID MIXER AND SAMPLE PUMPS
55	I-4	CONSTRUCTION DETAILS

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024
DESIGNED BY: A. HESS
DRAWN BY: N. HUNTER
CHECKED BY: M. METTS

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
DAVID MICHAEL METTS
No. 42588
CIVIL
STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
GENERAL
GENERAL NOTES, ABBREVIATIONS AND DRAWING LIST

SHEET
G-2

2 OF 55

34"x22" ORIGINAL SCALE IN INCHES 0 1 2

P:\101 Engineering\Petaluma, City of\15219_EGWRF Chemical System Upgrade\6-CAD\15219 SH01-03 G-1 to G-3.dwg 04/30/2024 09:11

PIPING SCHEDULE

GROUP NO.	PIPE SPEC	SPEC SECTION	TYPE/ CLASS	FITTINGS	EXTERIOR COATING	INTERIOR LINING
1	POLYVINYL CHLORIDE (PVC) 1120 (ASTM D1785, ANSI/NSF 61), NORMAL IMPACT, SOLVENT WELDED JOINTS	15066	SCH. 80	POLYVINYL CHLORIDE (PVC), NORMAL IMPACT, SOCKET SOLVENT WELD JOINTS (ASTM D2467).	BURIED: N/A ABOVE GROUND: INSTALL UV RESISTANT COATING	N/A
2	POLYVINYL CHLORIDE (PVC) (ASTM D1785), NORMAL IMPACT, SOLVENT WELDED JOINTS	15066	SCH. 80	POLYVINYL CHLORIDE (PVC), NORMAL IMPACT, SOCKET SOLVENT WELD JOINTS (ASTM D2467).	BURIED: N/A ABOVE GROUND: INSTALL UV RESISTANT COATING	N/A
3	DUCTILE IRON, ANSI A21.51 (AWWA C111, C115, C150, C151)	15061	CL350	DUCTILE IRON (AWWA C110) DUCTILE IRON (AWWA C153) FOR MJ FITTINGS FLG, MJ/RMJ, PO, GRV JOINTS PER PLANS	BURIED: PE ABOVE GROUND: EP	CML
4	CHLORINATED POLYVINYL CHLORIDE (CPVC) DOUBLE CONTAINMENT PIPING SYSTEM (ASTM F441)	15066	SCH. 80	CHLORINATED POLYVINYL CHLORIDE (CPVC), NORMAL IMPACT, SOCKET SOLVENT WELD JOINTS (ASTM F439).	BURIED: N/A ABOVE GROUND: INSTALL UV RESISTANT COATING	N/A
5	POLYVINYL CHLORIDE (PVC) GRAVITY SEWER PIPE, ASTM D 3034, SDR-35 (4"-15")	15065	SDR 35	PVC GASKETED SDR 35 PER PLANS SEE SPEC SECTION 15065	N/A	N/A
6	CHLORINATED POLYVINYL CHLORIDE (CPVC), NORMAL IMPACT, SOLVENT WELDED JOINTS (ASTM F441)	15066	SCH. 80	CHLORINATED POLYVINYL CHLORIDE (CPVC), NORMAL IMPACT, SOCKET SOLVENT WELD JOINTS (ASTM F439).	BURIED: N/A ABOVE GROUND: INSTALL UV RESISTANT COATING	N/A

JOINING METHOD MATERIAL CODES:

FLG	FLANGED
GRV	GROOVED
MJ	MECHANICAL JOINT
PO	PUSH-ON JOINT
RMJ	RESTRAINED MECHANICAL JOINT

LINING/COATING CODES:

CE	CERAMIC EPOXY
CML	CEMENT MORTAR LINING (OR COATING)
EP	EPOXY
PE	POLYETHYLENE WRAP

GENERAL ABBREVIATIONS:

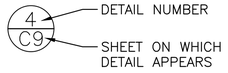
CL	CLASS
FTGS	FITTINGS
N/A	NOT APPLICABLE

NOTES:

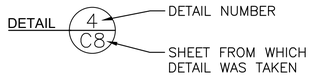
(1) FOR PVC COATING SPECIFICATIONS, REFER TO SECTION 15065.
(2) FOR ALL PAINTING SPECIFICATIONS OF PIPING AND FITTINGS, REFER TO SECTION 09800 AND SECTION 15051.
(3) WHERE PIPING IS ENCASED IN CONCRETE, MEET COATING REQUIREMENTS OF SECTION 09800.
(4) PROVIDE RESTRAINED JOINTS (JOINTS, FITTINGS, AND COUPLINGS) FOR ALL PIPING, EXCEPT GRAVITY SEWER AND DRAIN PIPING.
(5) WHERE RESTRAINED JOINTS ARE SHOWN OR SPECIFIED, CONTRACTOR MAY PROVIDE UNRESTRAINED JOINTS ONLY WHEN CONTRACTOR SUBMITS AND OBTAINS APPROVAL FOR CALCULATIONS THAT SHOW REQUIRED RESTRAINED LENGTH OF PIPE ADJACENT TO BENDS. CALCULATIONS SHALL USE HYDROSTATIC TEST PRESSURE.

DETAIL NUMBERING

DWG. WHERE DETAIL IS TAKEN:



DWG. WHERE DETAIL APPEARS:

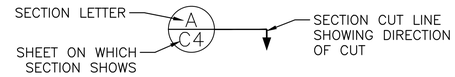


IF DETAIL APPEARS ON THE SAME DWG. IT IS TAKEN FROM:

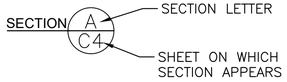


SECTION NUMBERING

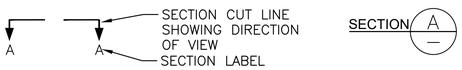
DWG. WHERE SECTION IS TAKEN:



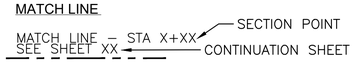
DWG. WHERE SECTION APPEARS:



IF SECTION APPEARS ON THE SAME DWG. IT IS TAKEN FROM:



MATCH LINE



SYMBOLS

PROPOSED	EXISTING	
		AIR RELIEF VALVE
		BLOWOFF
		FIRE HYDRANT
		VALVE
		ZONE VALVE
		REDUCER
		CLEAN OUT
		MANHOLE
		WATER METER
		CATCH BASIN
		CATCH BASIN W/ GALLERY
		INLET
		END CAP
		UTILITY POLE
PB	PB	UTILITY BOX
		MONUMENT
8" W	8" W	WATER MAIN
12" SD	12" SD	STORM DRAIN
E	E	ELECTRIC CABLE
G	G	GAS MAIN
SH	SH	CHEMICAL
	R/W	RIGHT OF WAY LINE

DESIGN CRITERIA

REFERENCE:

SEE PRELIMINARY DESIGN REPORT - ELLIS CREEK WATER RECYCLING FACILITY CHEMICAL SYSTEM UPGRADE (PHASE 1) DATED 2023

DESIGN ITEM	DESIGN VALUE
CHEMICAL TYPE	12.5% SODIUM HYPOCHLORITE
AVERAGE USAGE	22 GPH
MAXIMUM USAGE	100 GPH

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024
DESIGNED BY: A. HESS
DRAWN BY: N. HUNTER
CHECKED BY: M. METTS

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
JAMES MICHAEL METTS
No. 42588
CIVIL
STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

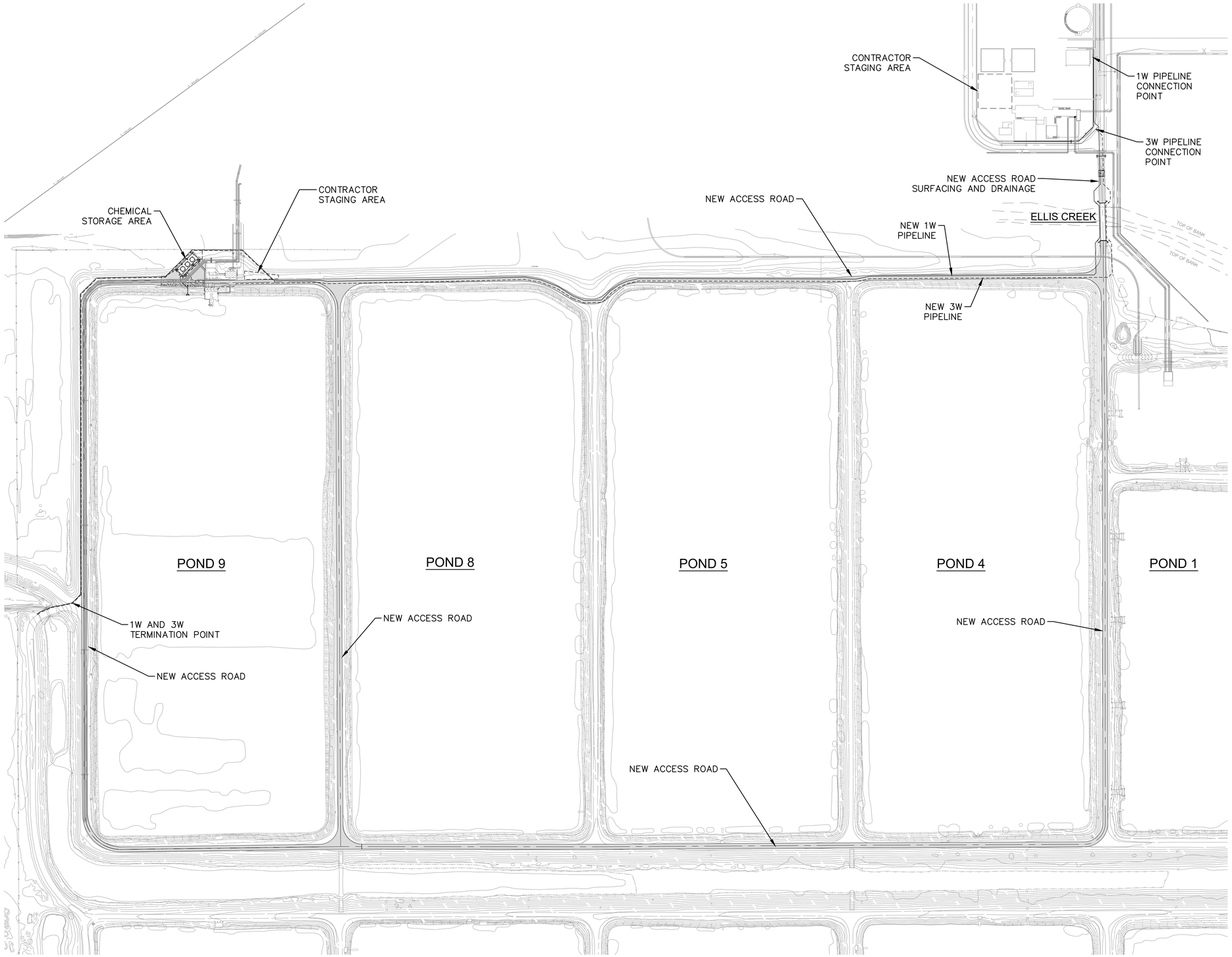
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
GENERAL
DESIGN CRITERIA , SYMBOLS AND SCHEDULES

SHEET
G-3

3 OF 55

34"x22" ORIGINAL SCALE IN INCHES 0 1 2

P:\101 Engineering\Petaluma, City of\15219_EC/WRF Chemical System Upgrade\6-CAD\15219 SHO1-03 G-1 to G-3.dwg 04/30/2024 08:41



PLAN
SCALE: 1"=120'

BENCHMARK

"THE LOCAL BENCHMARK FOR THIS SURVEY IS A SET CHISELED X IN CONCRETE, SET ON THE SOUTHEAST CORNER OF THE SOUTHERNLY RAMP; AT THE BEGIN CURVE OF THE CITY OF PETALUMA DRIVEWAY. WITH AN ELEVATION OF 19.03; NAVD 88"

BASIS OF BEARING

"THE BASIS OF COORDINATES FOR THIS SURVEY WAS PROVIDED BY ONLINE POSITION USER SERVICE (OPUS) UTILIZING CORS BASE STATIONS DG8212 P261 HUNTERHILLCN2004 CORS GRP, AM7023 OHLN OHLN ECC REF DIMPLE, DO7031 CASR SANTA ROSA CA CORS ARP WITH A COMBINED SCALE FACTOR 0.99962044 NAD83 CA ZONE 2"

GRAPHIC SCALE
0 120' 240'
SCALE: 1" = 120'

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024
DESIGNED BY: A. HESS
DRAWN BY: N. HUNTER
CHECKED BY: M. METTS

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
JAMES MICHAEL METTS
No. 42588
CIVIL
STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA. 94954
PH: 707-778-4546 FAX: 707-778-4508

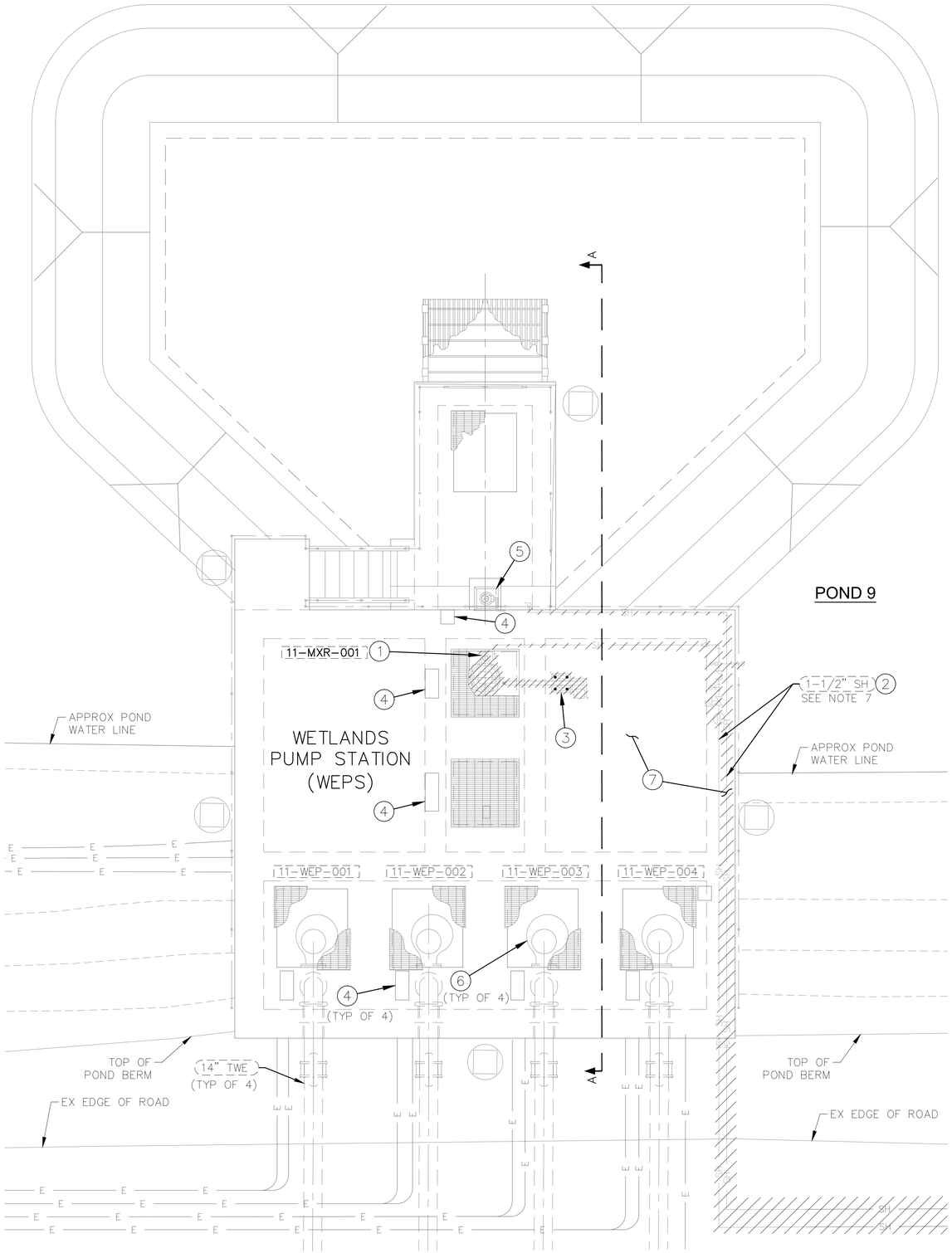
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
GENERAL
OVERALL SITE PLAN AND HORIZONTAL CONTROL

SHEET
G-4

4 OF 55

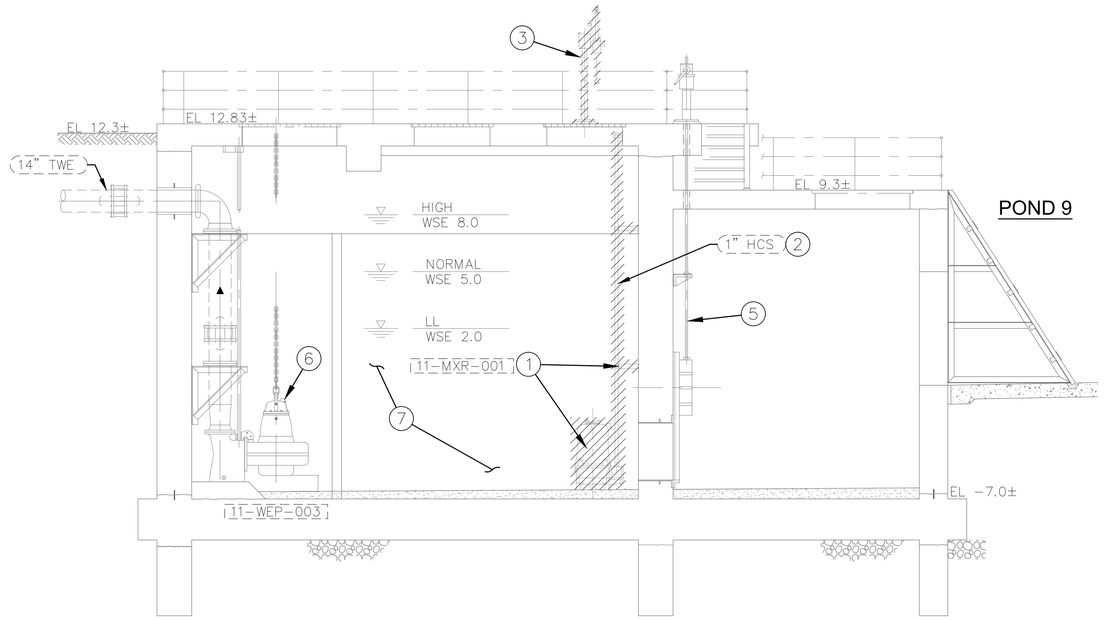
34"x22" ORIGINAL SCALE IN INCHES 0 1 2

P:\101 Engineering\Petaluma, City of\15219_ECWRF Chemical System Upgrade\6-CAD\15219 SH04 G-04.dwg 04/29/2024 16:15



POND 9

PLAN
SCALE: 1/4"=1'-0"



POND 9

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

DEMOLITION LEGEND

1. SALVAGE EXISTING CHEMICAL MIXER, GUIDE RAIL AND MOUNTING BRACKETS AND RETURN TO CITY
2. REMOVE AND PROPERLY DISPOSE OF EXISTING SODIUM HYPOCHLORITE CHEMICAL PIPING, APPURTENANCES AND SUPPORTS AS REQUIRED FOR INSTALLATION OF NEW CHEMICAL PIPING AND EQUIPMENT
3. SALVAGE EXISTING CHEMICAL MIXER UNIT HOIST AND RETURN TO CITY
4. PROTECT IN PLACE EXISTING ELECTRICAL
5. PROTECT IN PLACE EXISTING SLIDE GATE AND FRAME
6. PROTECT IN PLACE WEPS PUMPS
7. REPAIR EXISTING CONCRETE WALLS AND SURFACES AS NECESSARY PER STRUCTURAL DRAWING S-9

NOTES:

1. ALL EXISTING ITEMS, CALLED OUT OR NOT, SHALL BE PROTECTED IN PLACE UNLESS EXPLICITLY SPECIFIED OTHERWISE.
2. ALL FACILITIES SHOWN ON THIS DRAWING ARE EXISTING AND ARE REPRESENTED BASED ON REVIEW OF AVAILABLE RECORD DRAWINGS AND DESIGN DRAWINGS. CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY OF ANY DISCREPANCIES.
3. THE DRAWINGS ARE NOT INTENDED TO ITEMIZE OR LIMIT DEMOLITION AND THE CONTRACTOR SHALL CONSIDER THE SCOPE IN THE CONTEXT OF THE NEW WORK DEFINED ELSEWHERE IN THE CONTRACT DOCUMENTS AND BASED ON SITE INVESTIGATIONS.
4. WHERE PIPING, EQUIPMENT, OR PANELS ARE CALLED OUT FOR REMOVAL, REMOVE ALL FITTINGS, SUPPORTS, ANCHORS, AND APPURTENANCES UNLESS OTHERWISE NOTED.
5. SEE MECHANICAL DRAWINGS FOR CHEMICAL STORAGE AREA AND WEPS IMPROVEMENTS.
6. FOR PIPE SERVICE ABBREVIATIONS AND PIPING SYMBOLS SEE DRAWING M-1.
7. USE OF THE EXISTING SODIUM HYPOCHLORITE DOSING SYSTEM WILL BE REQUIRED DURING THE CONSTRUCTION PHASE, UNTIL THE THE PROPOSED SODIUM HYPOCHLORITE DOSING SYSTEM IS INSTALLED, TESTED AND IN OPERATION. DEMOLITION OF THE EXISTING DOSING SYSTEM SHALL NOT COMMENCE UNTIL APPROVED BY THE CITY OF PETALUMA STAFF.
8. NO VEHICULAR TRAFFIC ON ANY PORTION OF WEPS STRUCTURE.
9. CONTRACTOR TO COORDINATE WEPS SHUTDOWN WITH THE CITY PRIOR INITIATING DEMOLITION AND DEWATERING WORK WITHIN THE PUMP STATION STRUCTURE
10. CONTRACTOR TO COORDINATE CONCRETE INSPECTION AND CLEANING WITH THE CITY AS PART OF WEPS SHUTDOWN AND DEWATERING.

GRAPHIC SCALE
0 4' 8' 16'
SCALE: 1/8"=1'-0"

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024
DESIGNED BY: A. HESS
DRAWN BY: N. HUNTER
CHECKED BY: M. METTS

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
JAMES MICHAEL METTS
No. 42588
CIVIL
STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

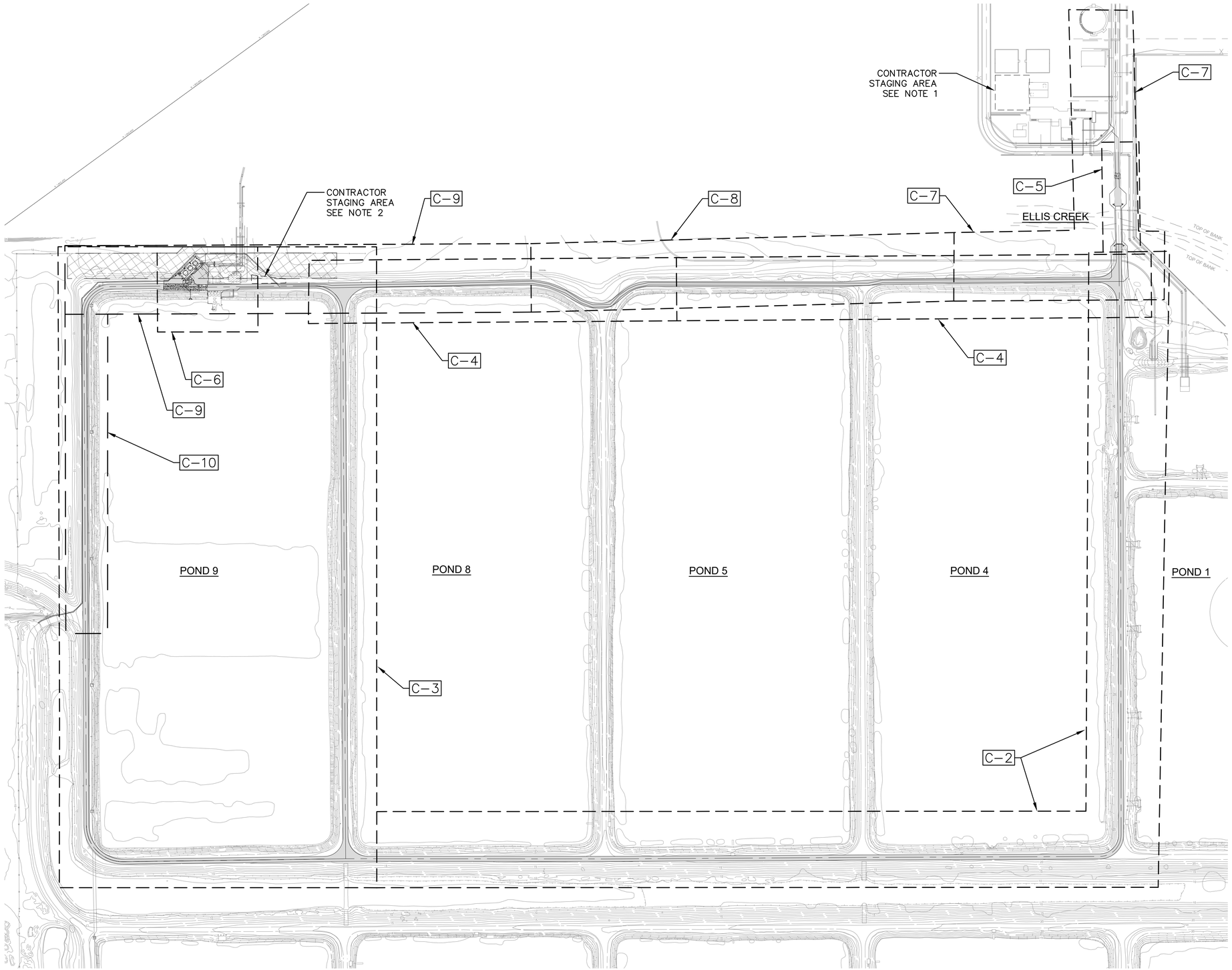
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT
AND RELOCATION
DEMOLITION
WETLANDS PUMP STATION PLAN AND SECTION

SHEET
D-1

5 OF 55

34"x22" ORIGINAL SCALE IN INCHES 0 1 2

P:\101 Engineering\Petaluma, City of\15219_ECWRF Chemical System Upgrade\6-CAD\15219 SH05 D-01.dwg 04/30/2024 10:39



PLAN
SCALE: 1"=120'

NOTES

1. CITY TO PROVIDE WATER AND POWER SUPPLY AND CONNECTION LOCATIONS FOR JOB TRAILER.
2. CONTRACTOR STORAGE AREA SHALL NOT CONFLICT WITH CITY OPERATIONS.

GRAPHIC SCALE
0 120' 240'
SCALE: 1" = 120'

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024
DESIGNED BY: A. HESS
DRAWN BY: N. HUNTER
CHECKED BY: M. METTS

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
JAMES MICHAEL METTS
No. 42586
CIVIL
STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH: 707-778-4546 FAX: 707-778-4508

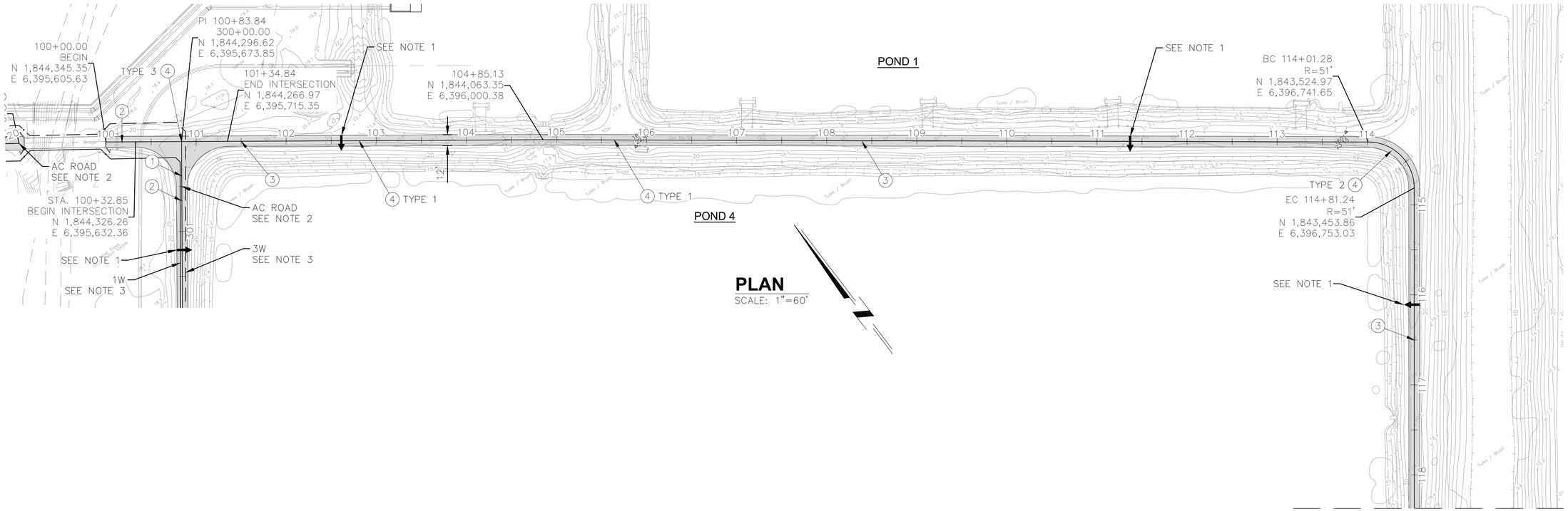
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
CIVIL
KEY MAP

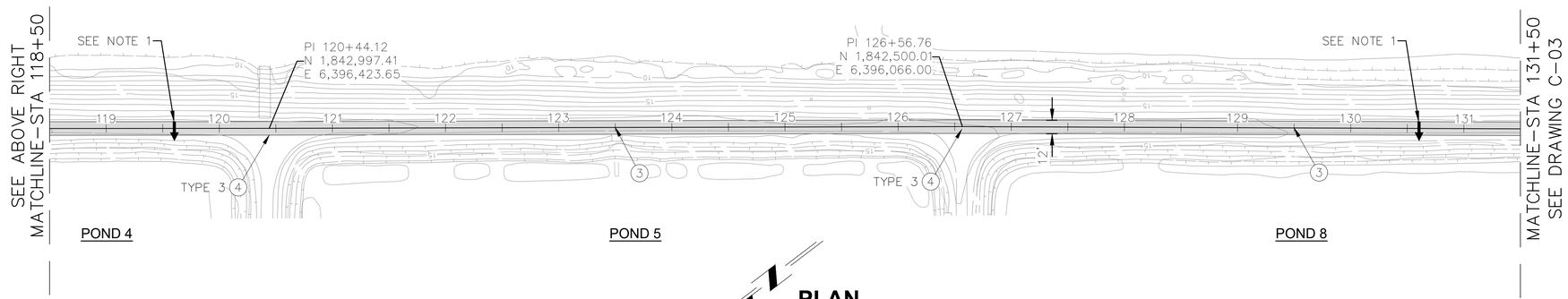
SHEET
C-1

6 OF 55

34"x22" ORIGINAL SCALE IN INCHES 0 1 2

P:\101 Engineering\Petaluma, City of\15219_ECWRF Chemical System Upgrade\6-CAD\15219 SH06 C-01.dwg 08/28/2024 13:46





CONSTRUCTION LEGEND

1. CROWNED ACCESS ROAD PER SECTION ON SHEET C–13
2. TRANSITION ACCESS ROAD
3. TILTED ACCESS ROAD PER SECTION ON SHEET C–13
4. INTERSECTION PER DETAIL ON SHEET C–13

NOTES:

1. GRADE NEW AC PAVEMENT TO DRAIN AS SHEETFLOW TO PONDS 4, 5, 8 AND 9.
2. SEE SHEET C–4 AND C–5 FOR CONTINUATION OF GRADING AND PAVING
3. SEE SHEET C–7, C–8 AND C–9 FOR CONTINUATION OF PIPING

LEGEND:

- 4" AC PAVEMENT OVER 13" AGGREGATE BASE
- 6" PCC PAVEMENT OVER 6" AGGREGATE BASE

GRAPHIC SCALE
0 60' 120'
SCALE: 1" = 60'

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024
DESIGNED BY: A. HESS
DRAWN BY: N. HUNTER
CHECKED BY: M. METTS

PROJECT NO.
C66501840

JAMES MICHAEL METTS
No. 42588
CIVIL
STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA. 94954
PH: 707-778-4546 FAX: 707-778-4508

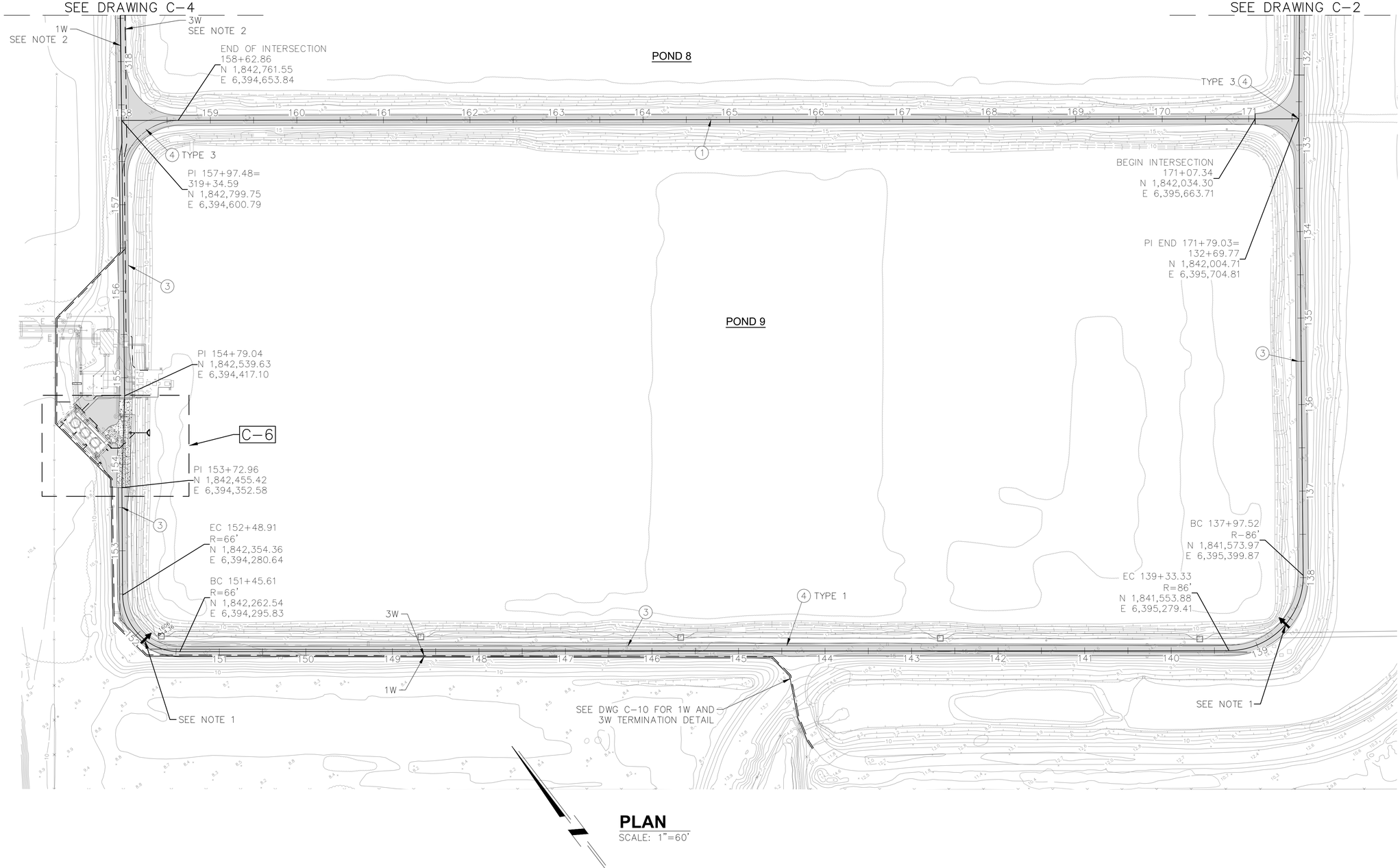
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
CIVIL
GRADING AND PAVING PLAN - 1

SHEET
C-2

7 OF 55

3.4"x22" ORIGINAL SCALE IN INCHES

P:\101 Engineering\Petaluma, City of\15219_ECWRF Chemical System Upgrade\6-CAD\15219 SH07 to 10 C-02 to C-05 GP Plans.dwg 04/29/2024 16:18



PLAN
SCALE: 1"=60'

CONSTRUCTION LEGEND

1. CROWNED ACCESS ROAD PER SECTION ON SHEET C–13
2. TRANSITION ACCESS ROAD
3. TILTED ACCESS ROAD PER SECTION ON SHEET C–13
4. INTERSECTION PER DETAIL ON SHEET C–13

LEGEND:

- 4" AC PAVEMENT OVER 13" AGGREGATE BASE
- 6" PCC PAVEMENT OVER 6" AGGREGATE BASE

NOTES:

1. GRADE NEW AC PAVEMENT TO DRAIN AS SHEETFLOW TO INTERIOR PONDS 4, 5, 8 AND 9.
2. SEE SHEET C–7, C–8 AND C–9 FOR CONTINUATION OF PIPING.
3. SEE SHEET C–6 FOR ENLARGED GRADING AND PAVING PLAN FOR CHEMICAL STORAGE AREA.

GRAPHIC SCALE
0 60' 120'
SCALE: 1" = 60'

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024
DESIGNED BY: A. HESS
DRAWN BY: N. HUNTER
CHECKED BY: M. METTS

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
JAMES MICHAEL METTS
No. 42588
CIVIL
STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH: 707-778-4546 FAX: 707-778-4508

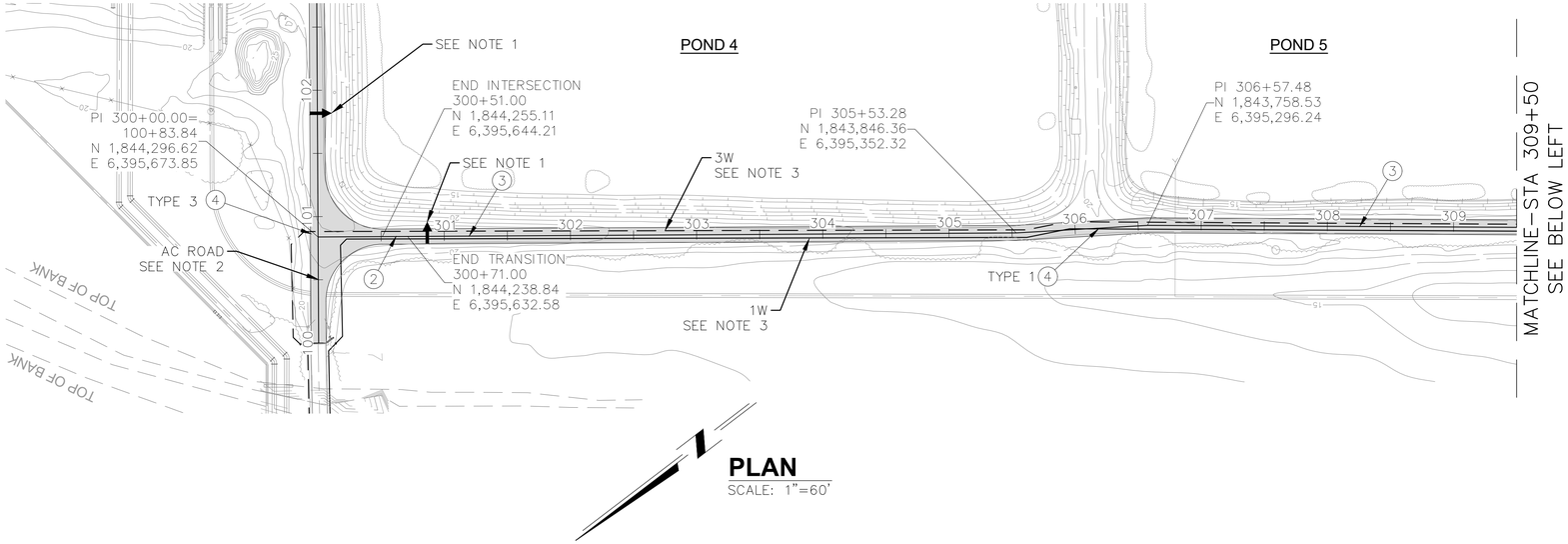
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT
AND RELOCATION
CIVIL
GRADING AND PAVING PLAN - 2

SHEET
C-3

8 OF 55

34"x22" ORIGINAL SCALE IN INCHES

P:\101 Engineering\Petaluma, City of\15219_ECWRF Chemical System Upgrade\6-CAD\15219 SH07 to 10 C-02 to C-05 GP Plans.dwg 04/29/2024 16:19



PLAN
SCALE: 1"=60'

PLAN
SCALE: 1"=60'

CONSTRUCTION LEGEND

1. CROWNED ACCESS ROAD PER SECTION ON SHEET C–13
2. TRANSITION ACCESS ROAD
3. TILTED ACCESS ROAD PER SECTION ON SHEET C–13
4. INTERSECTION PER DETAIL ON SHEET C–13

NOTES:

1. GRADE NEW AC PAVEMENT TO DRAIN AS SHEETFLOW TO PONDS 4, 5, 8 AND 9.
2. SEE SHEET C–2 AND C–3 FOR CONTINUATION OF ACCESS ROAD
3. SEE SHEET C–7, C–8 AND C–9 FOR CONTINUATION OF PIPING

LEGEND:

- 4" AC PAVEMENT OVER 13" AGGREGATE BASE
- 6" PCC PAVEMENT OVER 6" AGGREGATE BASE

GRAPHIC SCALE
0 60' 120'
SCALE: 1" = 60'

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024
DESIGNED BY: A. HESS
DRAWN BY: N. HUNTER
CHECKED BY: M. METTS

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
JAMES MICHAEL METTS
No. 42588
CIVIL
STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA. 94954
PH: 707-778-4546 FAX: 707-778-4508

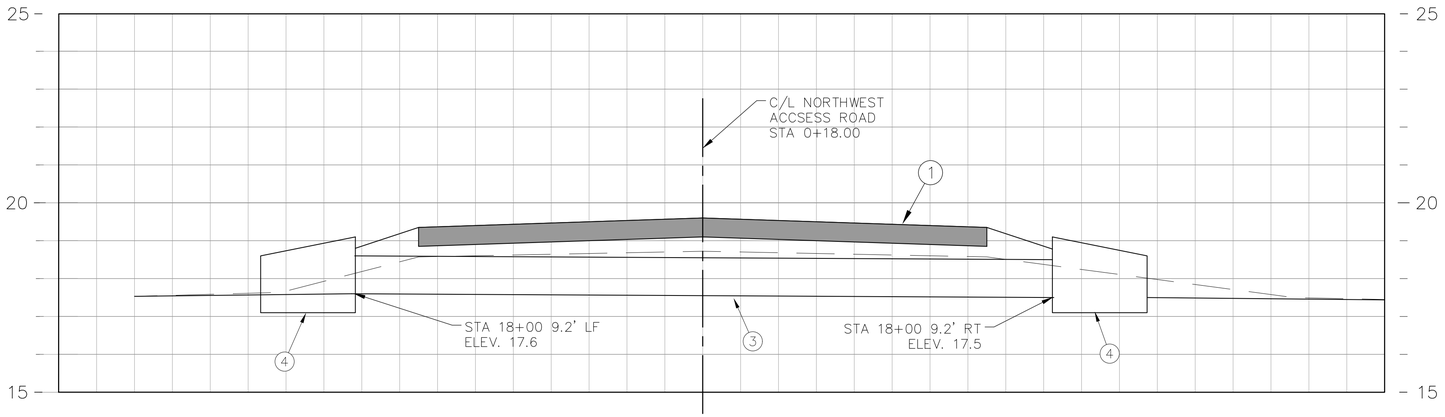
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT
AND RELOCATION
CIVIL
GRADING AND PAVING PLAN - 3

SHEET
C-4

9 OF 55

34"x22" ORIGINAL SCALE IN INCHES

P:\101\Engineering\Petaluma, City of\15219_ECWRF Chemical System Upgrade\6-CAD\15219 Sh07 to 10 C-02 to C-05 GP Plans.dwg 04/29/2024 16:20



SECTION A

SCALE: 1" = 2'

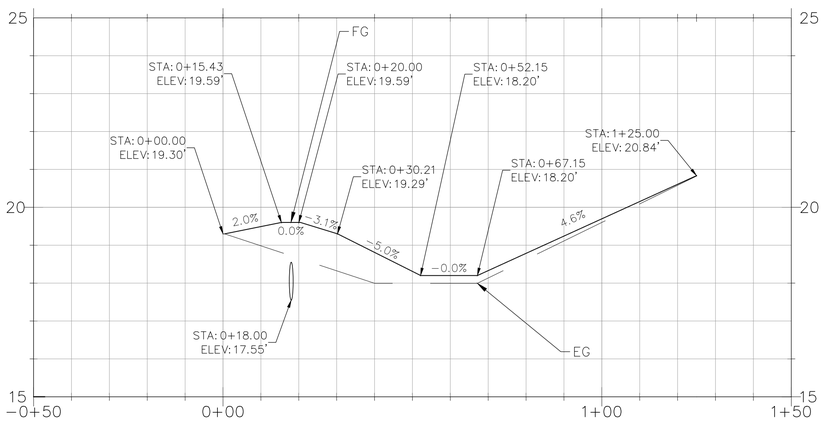
CONSTRUCTION LEGEND

1. CROWNED ACCESS ROAD PER SECTION ON SHEET C-13
2. PCC EDGE OF PAVEMENT PER DETAIL 2 ON SHEET C-15
3. 12" RCP (D-LOAD 2000) WITH CONCRETE SLURRY (2000 PSI) PIPE BEDDING. ENTIRE TRENCH SHALL BE SLURRY EXTENDING 4" MINIMUM AND ABOVE THE TOP OF THE PIPE
4. HEADWALL PER DETAIL 2 ON SHEET C-16

LEGEND:

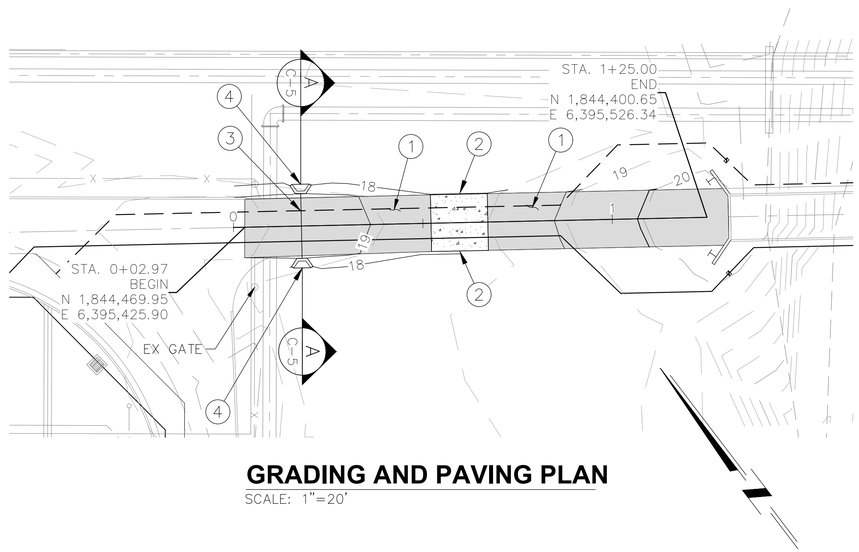
4" AC PAVEMENT OVER 13" AGGREGATE BASE

6" PCC PAVEMENT OVER 6" AGGREGATE BASE



GRADING AND PAVING PROFILE

SCALE: H: 1"=20' V: 1"=2'



GRADING AND PAVING PLAN

SCALE: 1"=20'

GRAPHIC SCALE
0 20' 40'
SCALE: 1" = 20'

GRAPHIC SCALE
0 2' 4'
SCALE: 1" = 2'

NORTHWEST ACCESS ROAD

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024
DESIGNED BY: A. HESS
DRAWN BY: N. HUNTER
CHECKED BY: M. METTS

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
JAMES MICHAEL METTS
No. 42588
CIVIL
STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA. 94954
PH: 707-778-4546 FAX: 707-778-4508

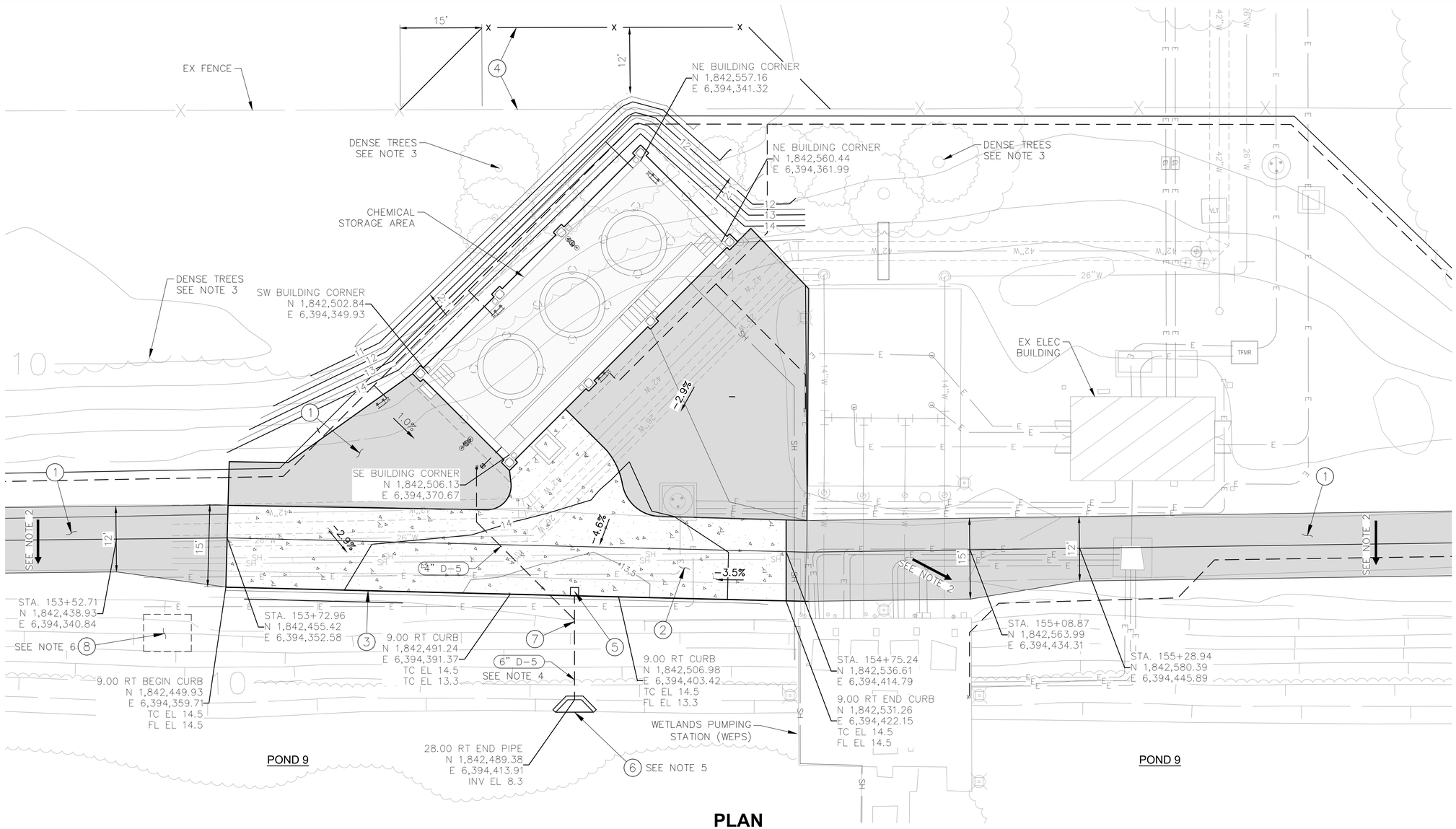
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
CIVIL
GRADING AND PAVING PLAN - 4

SHEET
C-5

10 OF 55

3.4"x22" ORIGINAL SCALE IN INCHES

P:\101 Engineering\Petaluma, City of\15219_ECWRF Chemical System Upgrade\6-CAD\15219 SH07 to 10 C-02 to C-05 GP Plans.dwg 04/29/2024 16:20



PLAN

SCALE: 1"=10'

CONSTRUCTION LEGEND

1. 4" AC PAVEMENT OVER 13" AGGREGATE BASE
2. 6" PCC PAVEMENT OVER 6" AGGREGATE BASE
3. PCC CURB PER DETAIL 5 ON SHEET C-15
4. REMOVE 80 LF OF EXISTING FENCE
   CONSTRUCT 90 LF OF FENCE
5. CATCH BASIN (BROOKS MODEL 1212 CB WITH TRAFFIC RATED STEEL GRATE OR APPROVED EQUAL)
6. HEADWALL PER DETAIL 2 ON SHEET C-16
7. 6" X 4 PVC WYE
8. REGRADE EMBANKMENT AT SINK HOLE

LEGEND:

- 4" AC PAVEMENT OVER 13" AGGREGATE BASE
- 6" PCC PAVEMENT OVER 6" AGGREGATE BASE

NOTES:

1. SEE MECHANICAL DRAWINGS FOR CHEMICAL STORAGE AREA AND WEPS IMPROVEMENTS.
2. GRADE NEW AC PAVEMENT TO DRAIN AS SHEETFLOW TO INTERIOR PONDS.
3. SEE SPECIFICATION SECTION 01205 AND 02050 FOR TREE REMOVAL.
4. BACKFILL AND PIPE ZONE FOR PIPE CROSSING POND LEVEE SHALL BE SAND-CEMENT SLURRY PER SPECIFICATION SECTION 02223 TRENCHING, BACKFILLING AND COMPACTING.
5. HEADWALL STRUCTURE IS AT POND 9 WATER SURFACE LEVEL. POND LEVEL WILL NOT BE LOWERED FOR CONSTRUCTION.
6. CAREFULLY OVER EXCAVATE (APROX) 2.5' WIDE X 3' DEEP SINKHOLE UNTIL FIRM SUBGRADE IS EXPOSED AT THE BOTTOM. OVER EXCAVATION SHALL EXTEND A MIN 3' LATERALLY BEYOND THE LIMITS OF THE VOID. BACKFILL WITH 1 SACK SAND CEMENT SLURRY OR ON-SITE CLAY SOIL. MOISTURE CONDITIONED TO AT LEAST 2% OVER THE OPTIMUM MOISTURE CONTENT AND COMPACTED TO AT LEAST 92% COMPACTION PER ASTM D1557. IF ONSITE SOIL IS USED, PLACE A CONTINUOUS SEGMENT OF FILTER FABRIC (MIRAFI 140N OR EQUAL) AT THE BOTTOM AND SIDE OF THE OVER EXCAVATED AREA. RELOCATE EXISTING RIPP-RAP AS REQUIRED.

GRAPHIC SCALE
0 10' 20'
SCALE: 1" = 10'

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024
DESIGNED BY: A. HESS
DRAWN BY: N. HUNTER
CHECKED BY: M. METTS

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
JAMES MICHAEL METTS
No. 42588
CIVIL
STATE OF CALIFORNIA

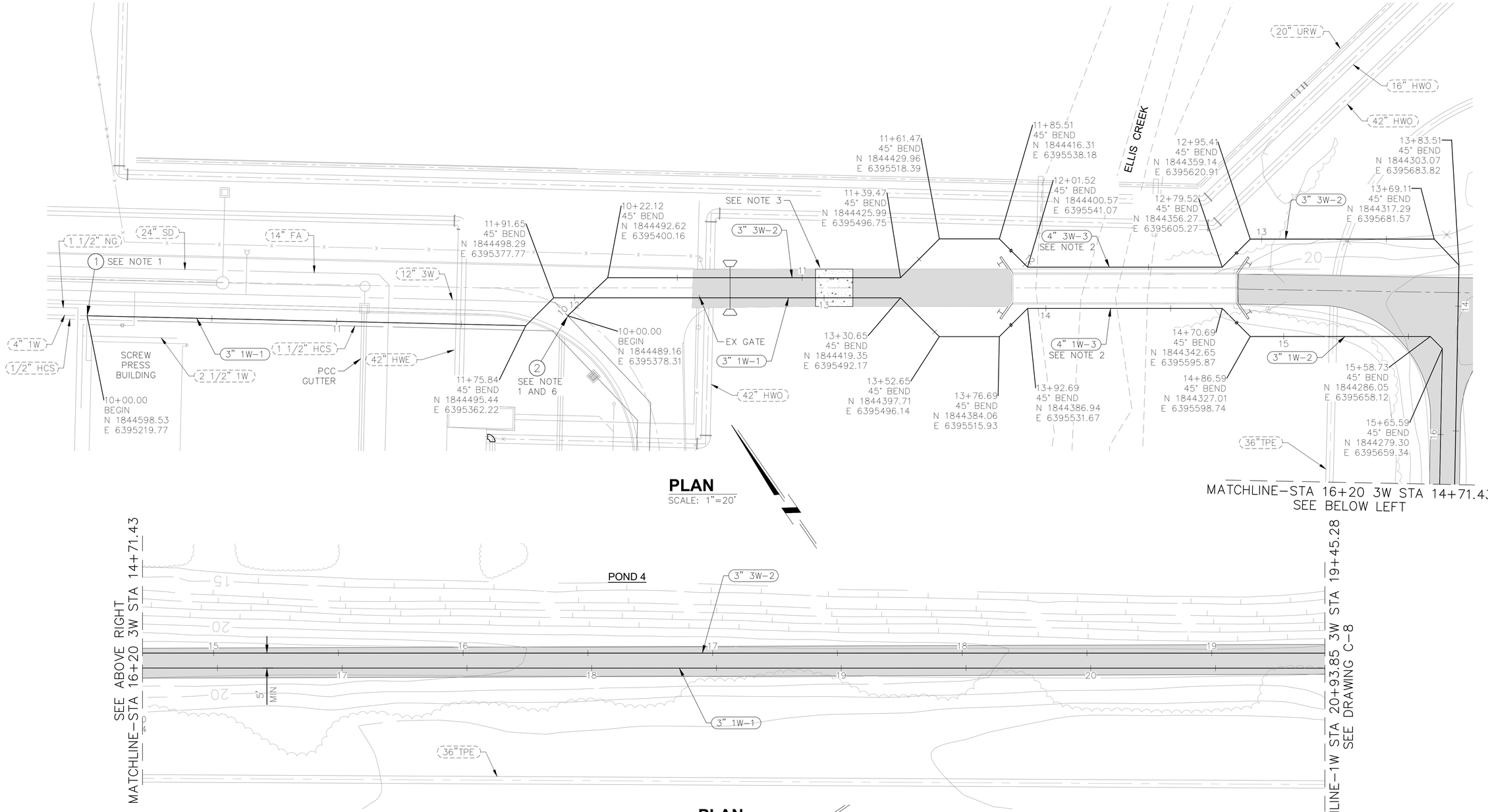
CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH: 707-778-4546 FAX: 707-778-4508

SODIUM HYPOCHLORITE SYSTEM REPLACEMENT
AND RELOCATION
CIVIL
CHEMICAL STORAGE AREA SITE PLAN

SHEET
C-6
11 OF 55

P:\101 Engineering\Petaluma, City of\15219_ECWRF Chemical System Upgrade\6-CAD\15219 SH11 C-06 Chem Area.dwg 04/29/2024 16:22

34"x22" ORIGINAL SCALE IN INCHES



PLAN
SCALE: 1"=20'

PLAN
SCALE: 1"=20'

CONSTRUCTION LEGEND

(1) 1W POINT OF CONNECTION PER DETAIL 1 ON SHEET C-14

(2) 3W POINT OF CONNECTION PER DETAIL 2 ON SHEET C-14

NOTES:

1. SEE SHEET C-14 FOR ENLARGED PLAN. FIELD VERIFY 1W AND 3W POINT OF CONNECTION.
2. SEE SHEET C-12 FOR PIPE BRIDGE CROSSING ENLARGED PLAN AND SECTION.
3. SEE SHEET C-5 FOR GRADING, PAVING AND DRAINAGE IMPROVEMENTS.
4. SEE SHEET G-3 PIPE SCHEDULE.
5. SEE SHEET C-16 DETAIL 1 FOR 1W AND 3W PIPE TRENCH DETAIL.
6. FIELD VERIFY 1W AND 3W CROSSING CONDITIONS.

GRAPHIC SCALE
0 20' 40'
SCALE: 1" = 20'

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024
DESIGNED BY: A. HESS
DRAWN BY: N. HUNTER
CHECKED BY: M. METTS

PROJECT NO.
C66501840



CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH: 707-778-4546 FAX: 707-778-4508

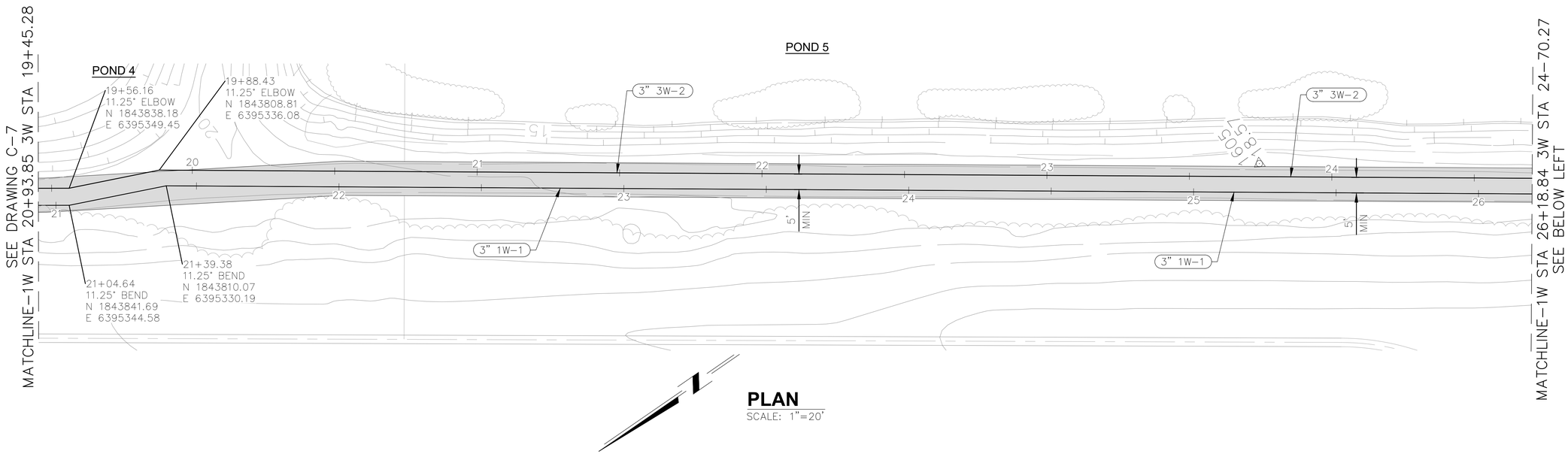
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
CIVIL
YARD PIPING PLANS - 1

SHEET
C-7

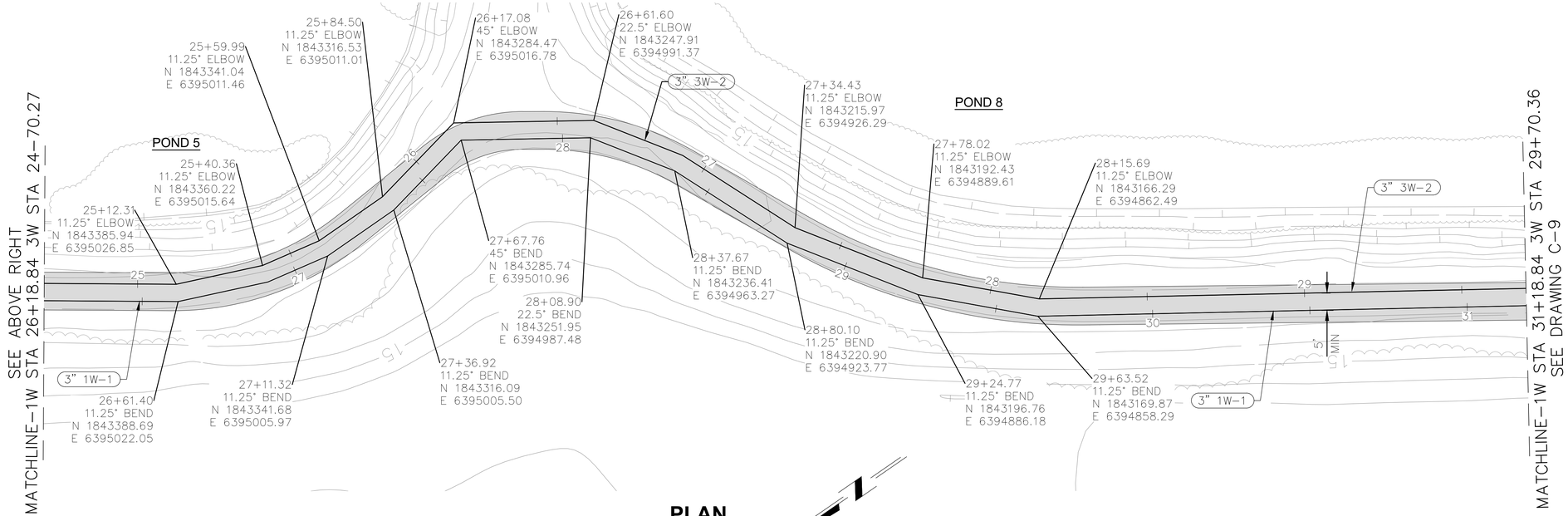
12 OF 55

P:\101 Engineering\Petaluma, City of\15219_ECWRF Chemical System Upgrade\6-CAD\15219 SH12 to15 C-07 to C-10 pipe.dwg 04/29/2024 16:24

34"x22" ORIGINAL SCALE IN INCHES 0 1 2



PLAN
SCALE: 1"=20'



PLAN
SCALE: 1"=20'

NOTES:

1. SEE SHEET G-3 FOR PIPE SCHEDULE
2. SEE SHEET C-16 FOR PIPE TRENCH DETAIL
3. SEE SHEET C-4 FOR GRADING AND PAVING IMPROVEMENTS

GRAPHIC SCALE
0 20' 40'
SCALE: 1" = 20'

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024
DESIGNED BY: A. HESS
DRAWN BY: N. HUNTER
CHECKED BY: M. METTS

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
JAMES MICHAEL METTS
No. 42588
CIVIL
STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA. 94954
PH: 707-778-4546 FAX: 707-778-4508

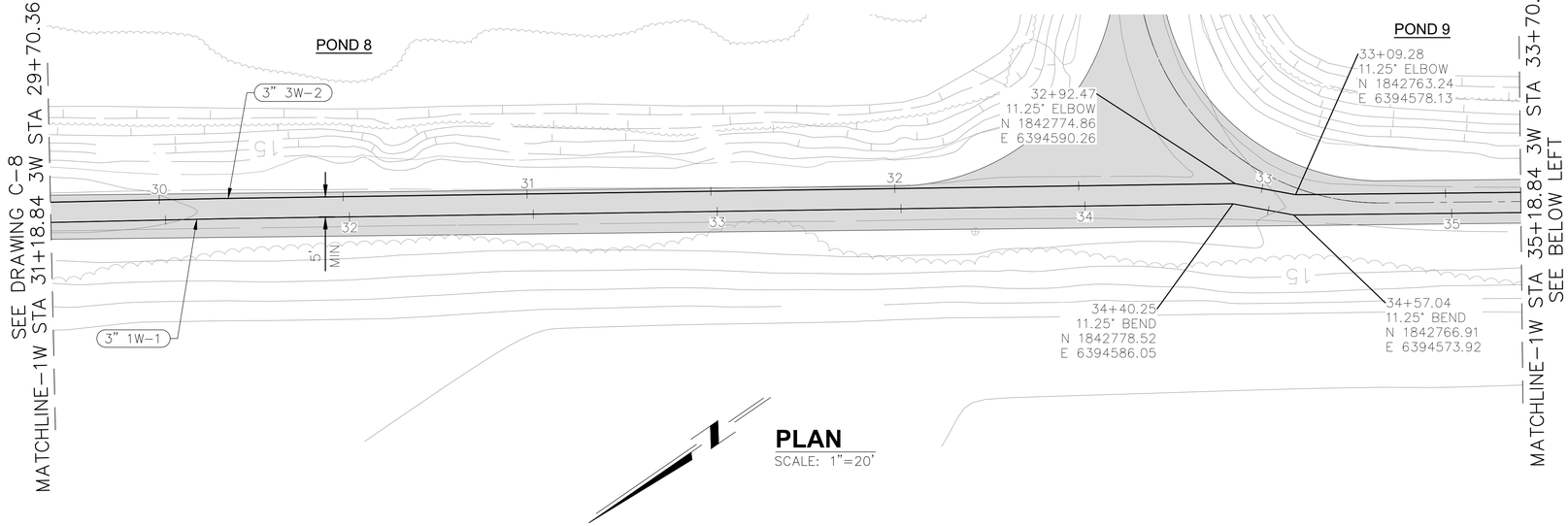
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
CIVIL
YARD PIPING PLANS - 2

SHEET
C-8

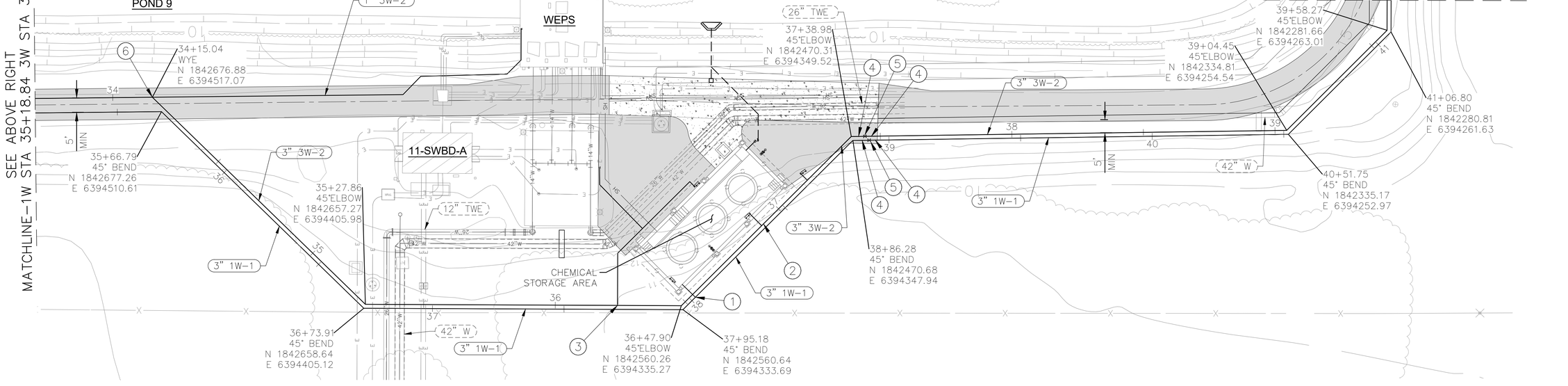
13 OF 55

34"x22" ORIGINAL SCALE IN INCHES

P:\101 Engineering\Petaluma, City of\15219_ECWRF Chemical System Upgrade\6-CAD\15219 SH12 to15 C-07 to C-10 pipe.dwg 04/29/2024 16:25



PLAN
SCALE: 1"=20'



PLAN
SCALE: 1"=20'

CONSTRUCTION LEGEND

1. 1W POINT OF CONNECTION (3" x 1" TEE)
2. 3W POINT OF CONNECTION (3" x 1" TEE)
3. 3" X 2" TEE
4. 3" SPOOL (FLG X PE)
5. 3" GATE VALVE (FLG X FLG) PER CITY STANDARD DRAWING NO. 877
6. 3W POINT ON CONNECTION (3" X 1" WYE)

NOTES:

1. SEE SHEET G-3 FOR PIPE SCHEDULE.
2. SEE SHEET C-16 FOR PIPE TRENCH DETAIL.
3. SEE MECHANICAL DRAWINGS FOR CONTINUATION OF 1W AND 3W LATERAL PIPING.
4. SEE SHEET C-3 AND C-6 FOR GRADING AND PAVING IMPROVEMENTS.

GRAPHIC SCALE
0 20' 40'
SCALE: 1" = 20'

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024
DESIGNED BY: A. HESS
DRAWN BY: N. HUNTER
CHECKED BY: M. METTS

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
JAMES MICHAEL METTS
No. 42588
CIVIL
STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd. PETALUMA, CALIFORNIA. 94954
PH. 707-778-4546 FAX. 707-778-4508

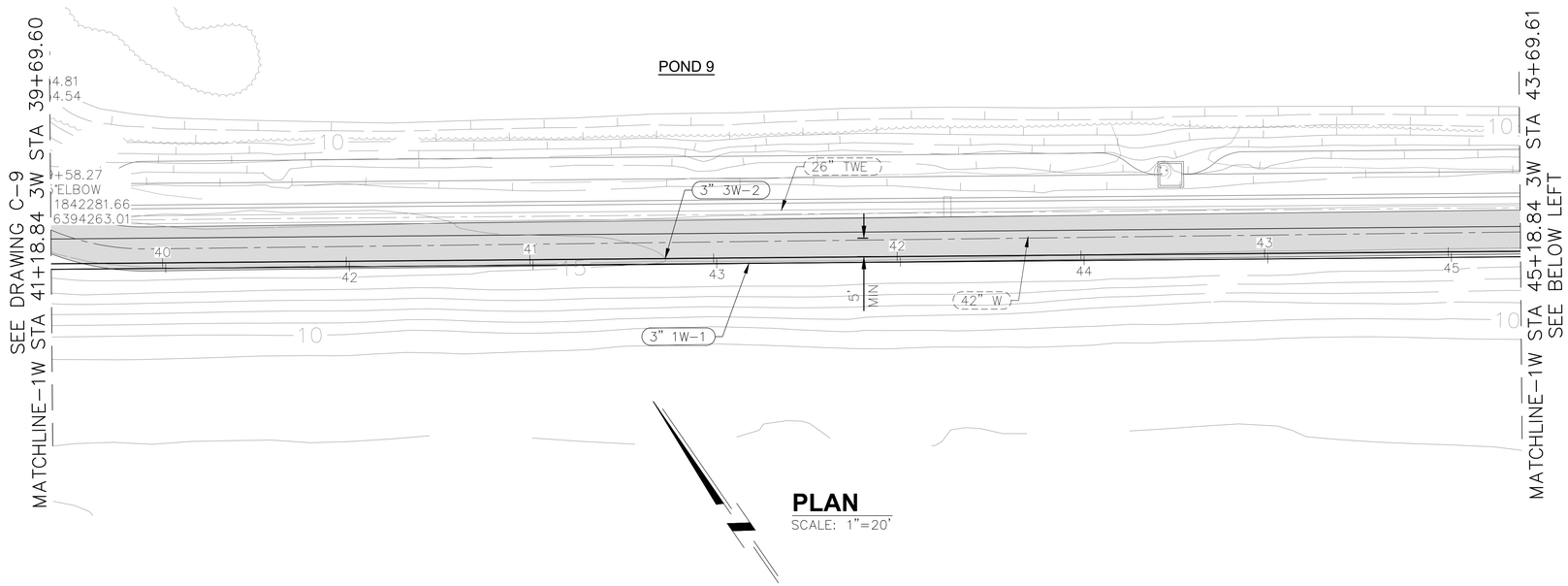
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
CIVIL
YARD PIPING PLANS - 3

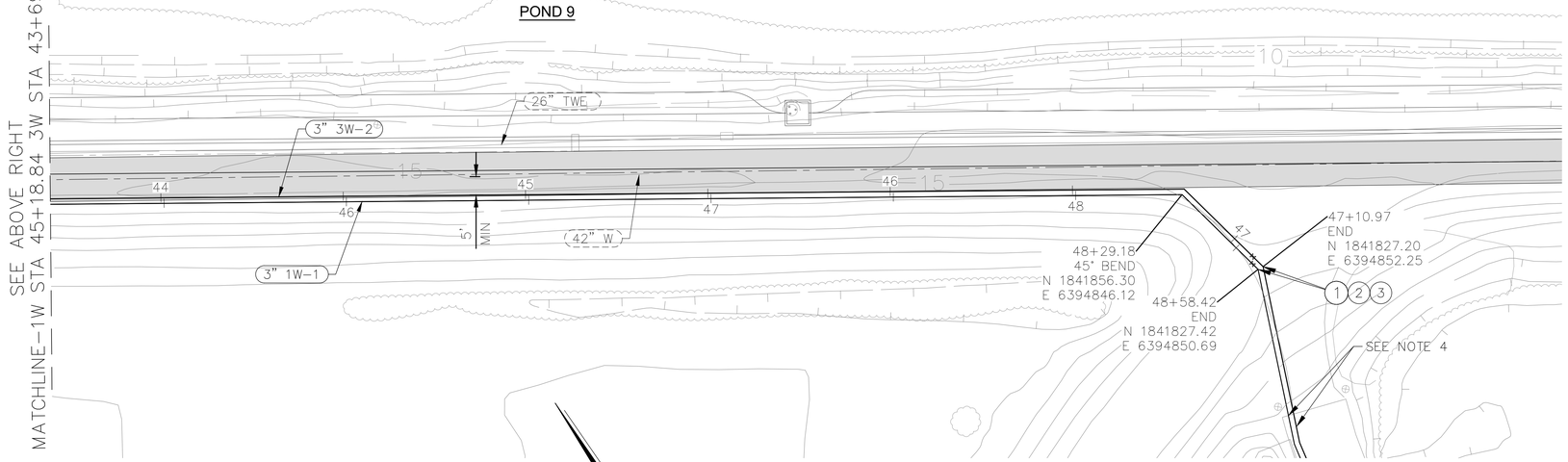
SHEET
C-9

14 OF 55

3.4"x22" ORIGINAL SCALE IN INCHES 0 1 2

P:\101 Engineering\Petaluma, City of\15219_EC/WRF Chemical System Upgrade\6-CAD\15219 SH12 to15 C-07 to C-10 pipe.dwg 04/29/2024 16:26





CONSTRUCTION LEGEND

1. 3" PVC SPOOL (FLG X FLG)
2. 3" GATE VALVE (FLG X FLG) PER CITY STANDARD DRAWING NO. 877
3. 3" DI BLIND FLANGE

NOTES:

1. SEE SHEET C-3 FOR ACCESS IMPROVEMENTS.
2. SEE SHEET G-3 FOR PIPE SCHEDULE.
3. SEE SHEET C-16 FOR PIPE TRENCH DETAIL.
4. FUTURE CONTINUATION OF PIPING UNDER SEPARATE CONTRACT

GRAPHIC SCALE
0 20' 40'
SCALE: 1" = 20'

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024
DESIGNED BY: A. HESS
DRAWN BY: N. HUNTER
CHECKED BY: M. METTS

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
JAMES MICHAEL METTS
No. 42588
CIVIL
STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA. 94954
PH: 707-778-4546 FAX: 707-778-4508

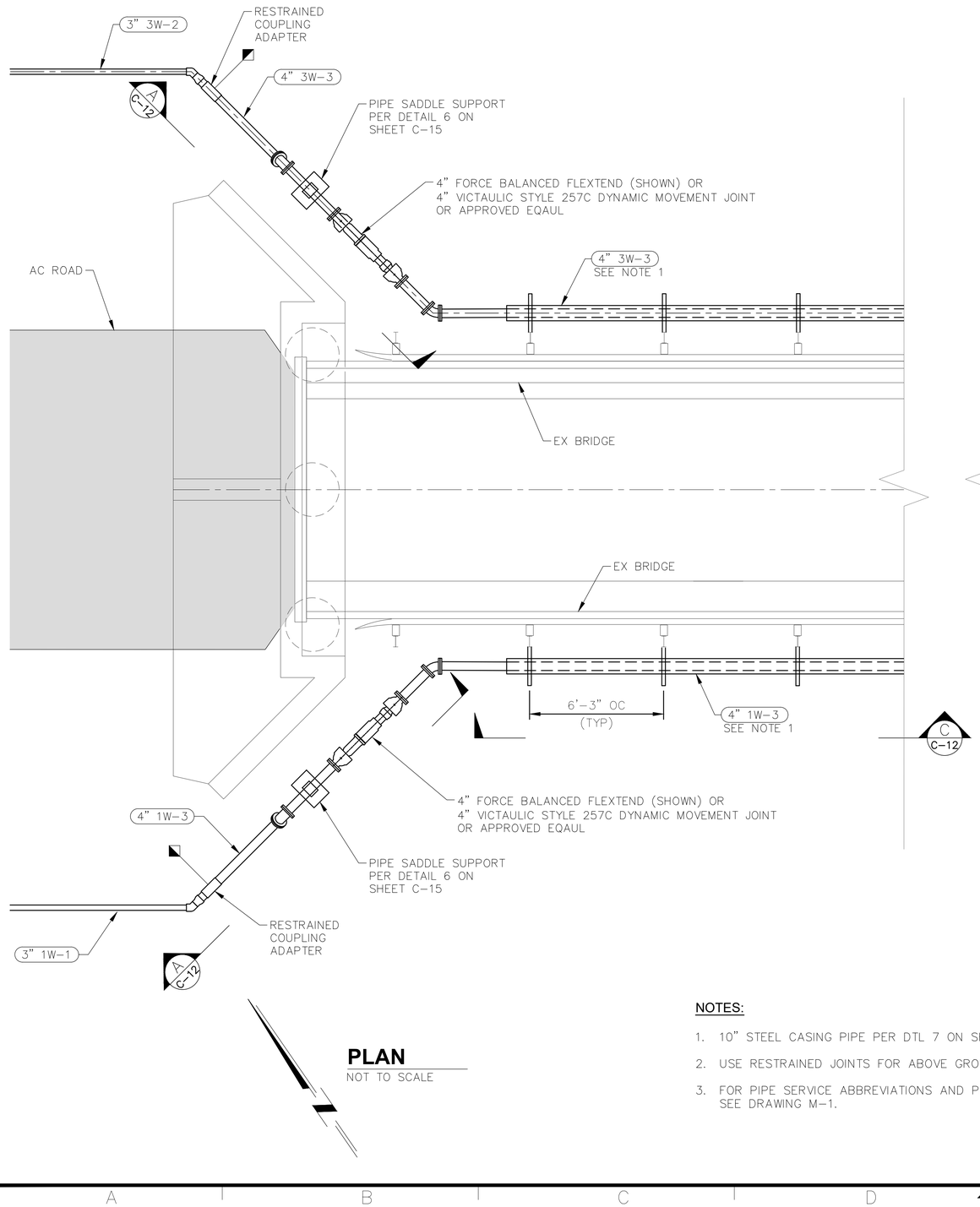
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
CIVIL
YARD PIPING PLANS - 4

SHEET
C-10

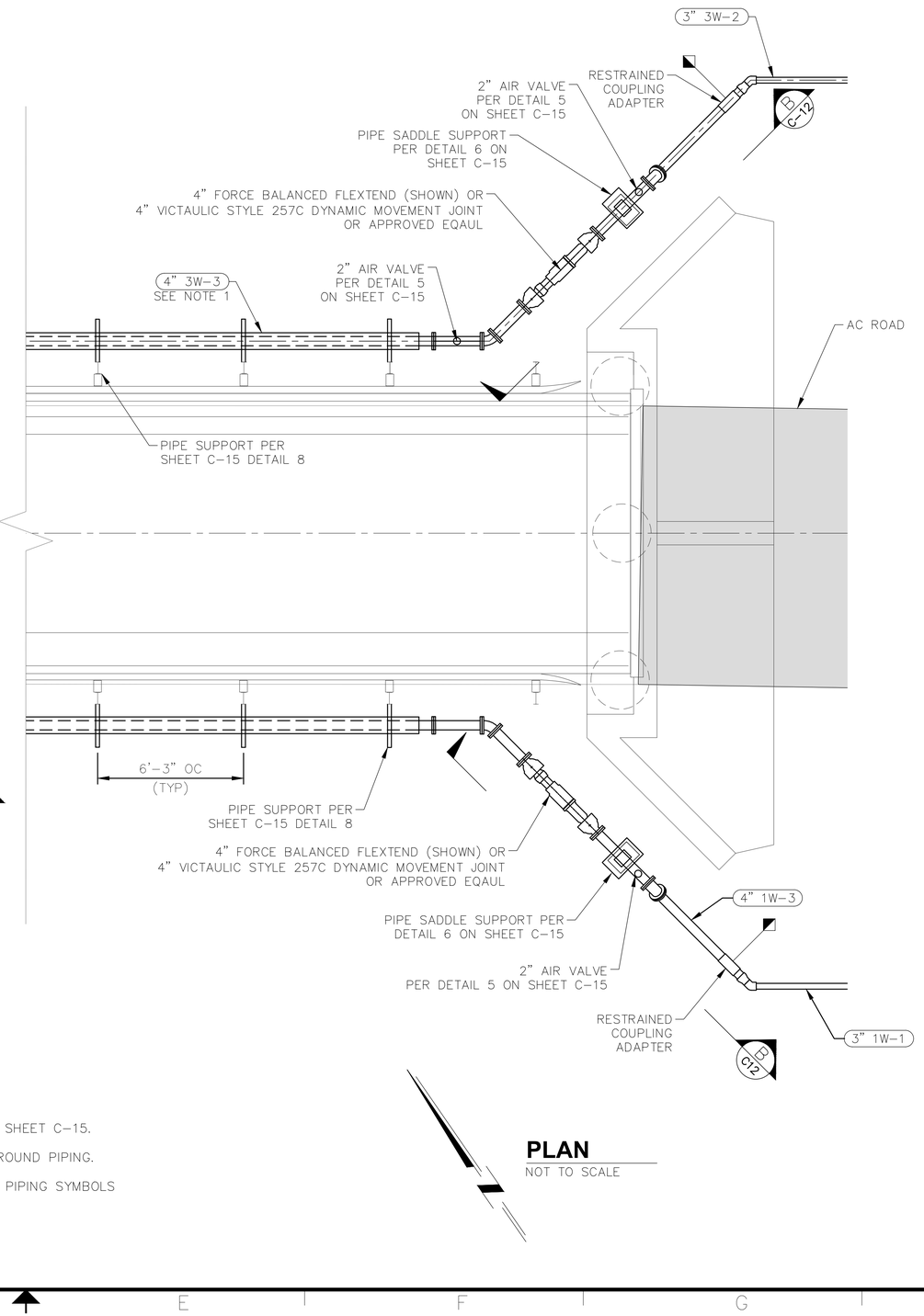
15 OF 55

34"x22" ORIGINAL SCALE IN INCHES

P:\101 Engineering\Petaluma, City of\15219_ECWRF Chemical System Upgrade\6-CAD\15219 SH12 to15 C-07 to C-10 pipe.dwg 04/29/2024 16:27



PLAN
NOT TO SCALE



PLAN
NOT TO SCALE

NOTES:

1. 10" STEEL CASING PIPE PER DTL 7 ON SHEET C-15.
2. USE RESTRAINED JOINTS FOR ABOVE GROUND PIPING.
3. FOR PIPE SERVICE ABBREVIATIONS AND PIPING SYMBOLS SEE DRAWING M-1.

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024
DESIGNED BY: A. HESS
DRAWN BY: N. HUNTER
CHECKED BY: M. METTS

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER JAMES MICHAEL METTS No. 42580 CIVIL STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH: 707-778-4546 FAX: 707-778-4508

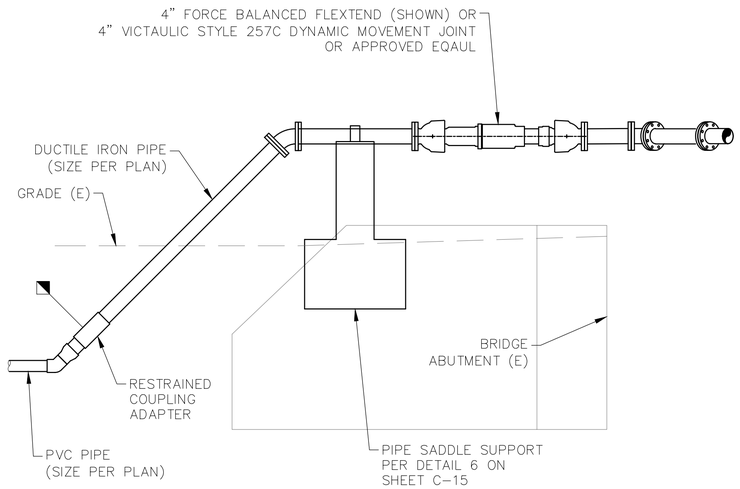
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
CIVIL
PIPE BRIDGE CROSSING -1

SHEET
C-11

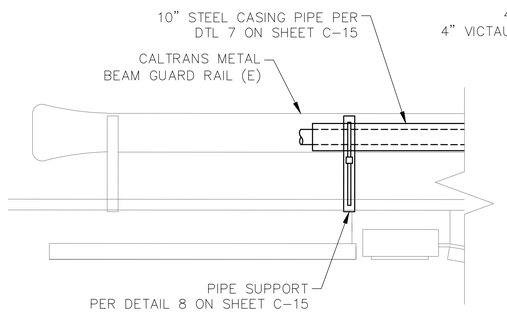
16 OF 55

3.4"x22" ORIGINAL SCALE IN INCHES

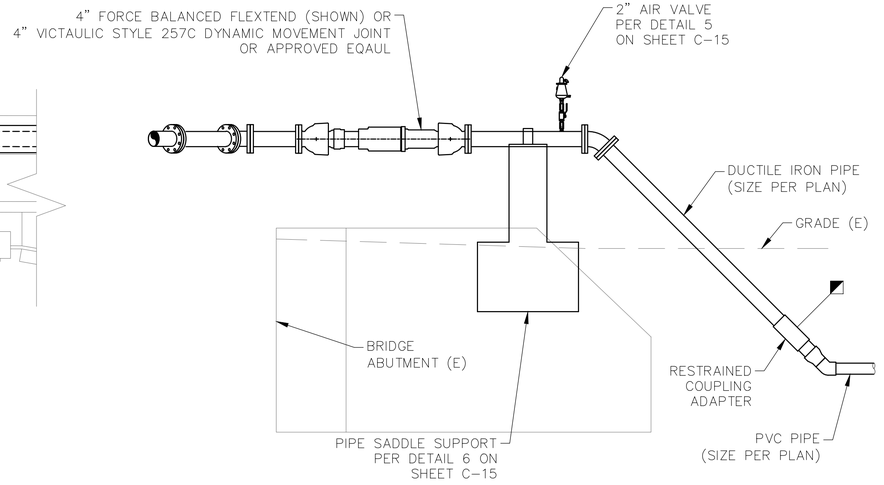
P:\101 Engineering\Petaluma, City of\15219_ECWRF Chemical System Upgrade\6-CAD\15219 SH16 to 17 C-11 to C-12 Pipe Bridge.dwg 04/29/2024 16:30



SECTION
SCALE: 1" = 2'
A C-11



SECTION
SCALE: 1" = 2'
C C-11



SECTION
SCALE: 1" = 2'
B C-11

NOTE:

1. GENERAL PIPE SECTION. SECTION IS GOOD FOR 1W AND 3W PIPING ON BOTH SIDES OF THE BRIDGE.
2. FOR PIPING SYMBOLS SEE DRAWING M-1.

GRAPHIC SCALE
0 2' 4'
SCALE: 1" = 2'

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024
DESIGNED BY: A. HESS
DRAWN BY: N. HUNTER
CHECKED BY: M. METTS

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
JAMES MICHAEL METTS
No. 42580
CIVIL
STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA. 94954
PH: 707-778-4546 FAX: 707-778-4508

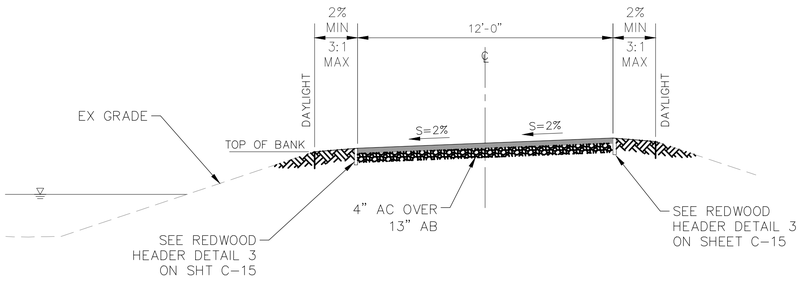
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT
AND RELOCATION
CIVIL
PIPE BRIDGE CROSSING -2

SHEET
C-12

17 OF 55

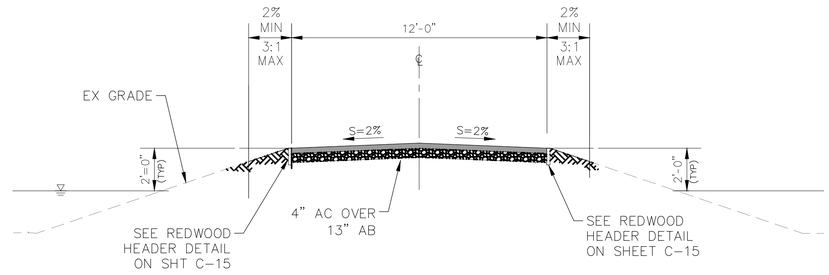
3.4"x22" ORIGINAL SCALE IN INCHES

P:\101 Engineering\Petaluma, City of\15219_EcWRF Chemical System Upgrade\6-CAD\15219 SH16 to 17 C-11 to C-12 Pipe Bridge.dwg 04/29/2024 16:32



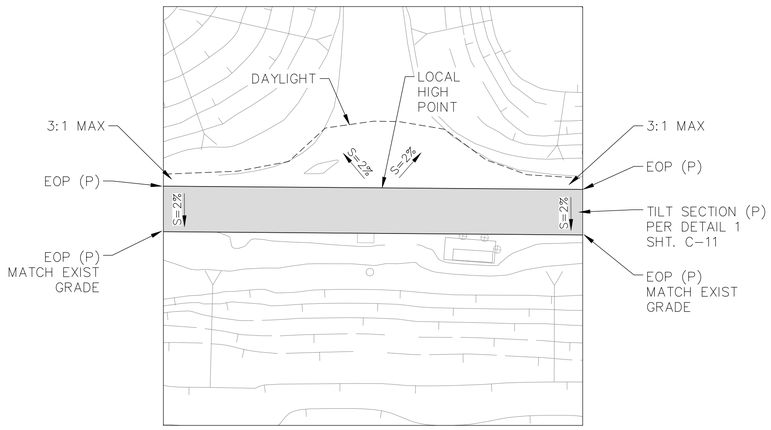
TYPICAL SECTION - TILT

NOT TO SCALE

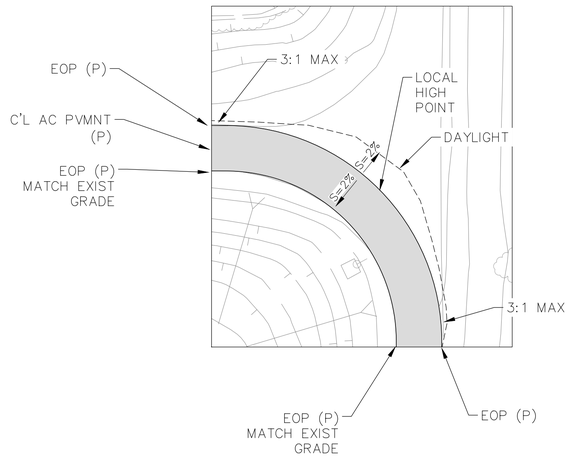


TYPICAL SECTION - CROWN

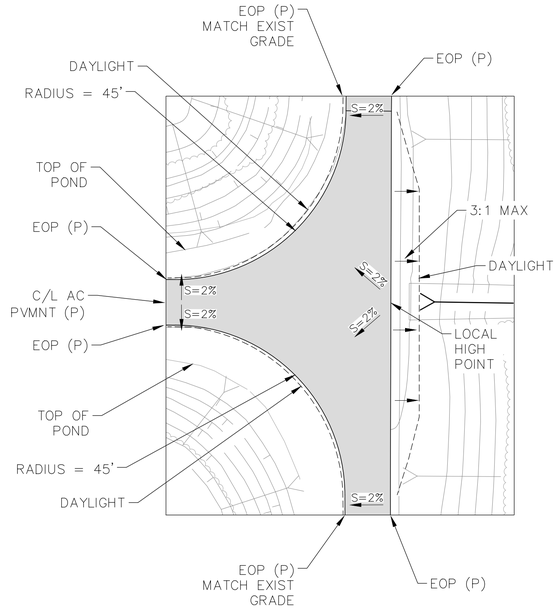
NOT TO SCALE



TYPE 1



TYPE 2



TYPE 3

TYPICAL INTERSECTION DETAILS

NOT TO SCALE

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024 | DESIGNED BY: A. HESS | DRAWN BY: N. HUNTER | CHECKED BY: M. METTS

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
JAMES MICHAEL METTS
No. 42588
CIVIL
STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA. 94954
PH: 707-778-4546 FAX: 707-778-4508

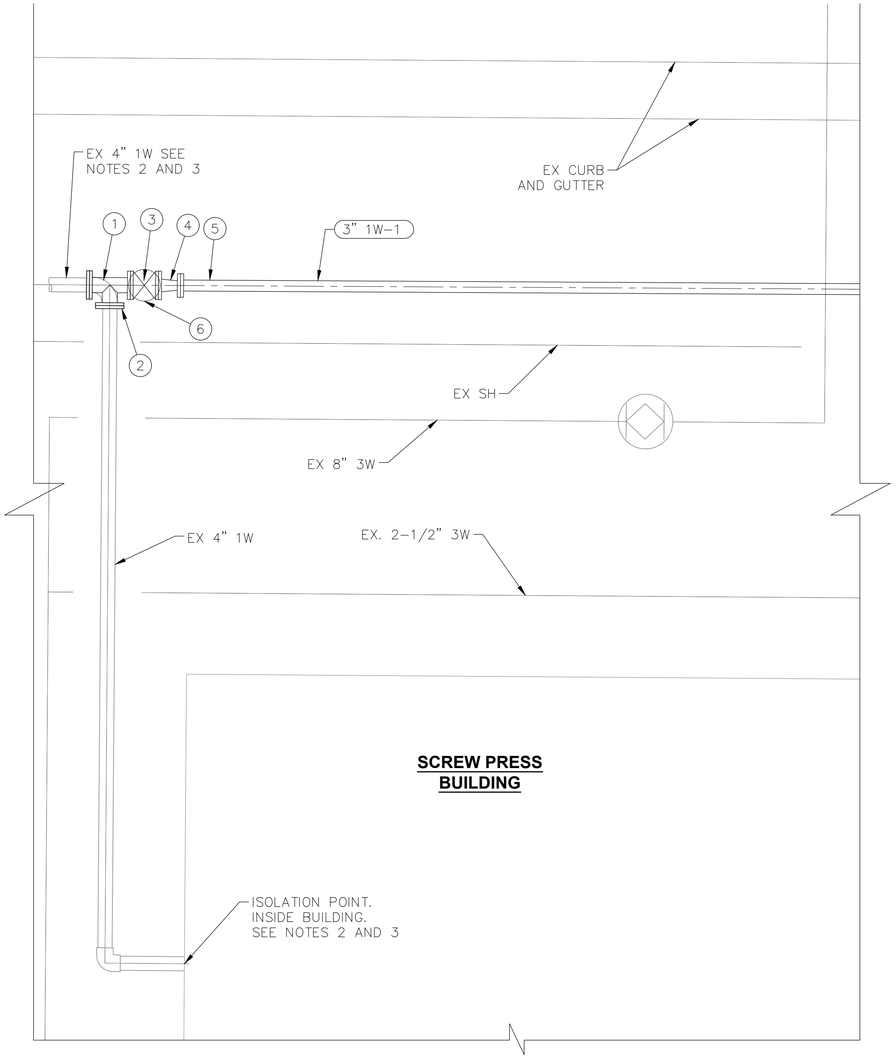
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT
AND RELOCATION
CIVIL
ACCESS ROAD SECTIONS AND DETAILS

SHEET
C-13

18 OF 55

P:\101 Engineering\Petaluma, City of\15219_ECWRF Chemical System Upgrade\6-CAD\15219 SH18 C-13 Sections.dwg 04/29/2024 16:44

34"x22" ORIGINAL SCALE IN INCHES



CONSTRUCTION LEGEND

1. REMOVE AND DISPOSE OF EX 90-DEG ELBOW
2. 4" DI TEE (FLG)
3. 4" GATE VALVE (FLG) PER CITY STANDARD DRAWING NO. 877
4. 4" X 3" DI REDUCER (FLG)
5. 3" PVC SPOOL (FLG X PE)

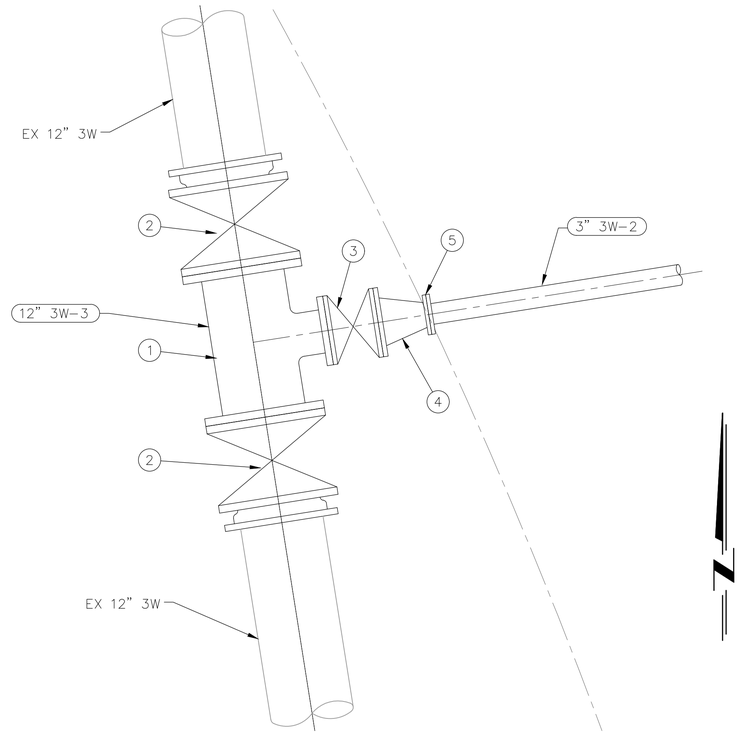
NOTES:

1. CONTRACTOR TO FIELD VERIFY POINT OF CONNECTION LOCATION AND CONNECTION CONDITIONS PRIOR TO ORDERING PIPE AND JOINING MATERIALS
2. PROVIDE ADVANCED NOTICE TO CITY OF SCHEDULED 1W SHUTDOWN, SEE SPECIFICATION SECTION 01140
3. COORDINATE SHUTDOWN, DRAINING AND FILLING OF WATER LINES, AND OPERATIONS OF EXISTING VALVES WITH CITY OPERATIONS, SEE SPECIFICATION SECTION 01140

1W POINT OF CONNECTION DETAIL

NOT TO SCALE

(1) C-7



PLAN

CONSTRUCTION LEGEND

1. 12" X 6" DI TEE (FLG X FLG)
2. 12" GATE VALVE (FLG X MJ) PER CITY STANDARD DRAWING NO. 877
3. 6" GATE VALVE (FLG X FLG) PER CITY STANDARD NO. 877
4. 6" X 3" DI REDUCER (FLG)
5. 3" PVC SPOOL (FLG X PE)

NOTES:

1. CONTRACTOR TO FIELD VERIFY POINT OF CONNECTION LOCATION AND CONNECTION CONDITIONS PRIOR TO ORDERING PIPE AND JOINING MATERIALS.
2. PROVIDE ADVANCED NOTICE TO CITY OF SCHEDULED 3W SHUTDOWN, SEE SPECIFICATION SECTION 01140.
3. COORDINATE SHUTDOWN, DRAINING AND FILLING OF WATER LINE AND OPERATIONS OF EXISTING VALVES WITH CITY, SEE SPECIFICATION SECTION 01140.

3W POINT OF CONNECTION DETAIL

NOT TO SCALE

(2) C-7

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024
DESIGNED BY: A. HESS
DRAWN BY: N. HUNTER
CHECKED BY: M. METTS

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
ADAM MICHAEL METTS
No. 42588
CIVIL
STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH: 707-778-4546 FAX: 707-778-4508

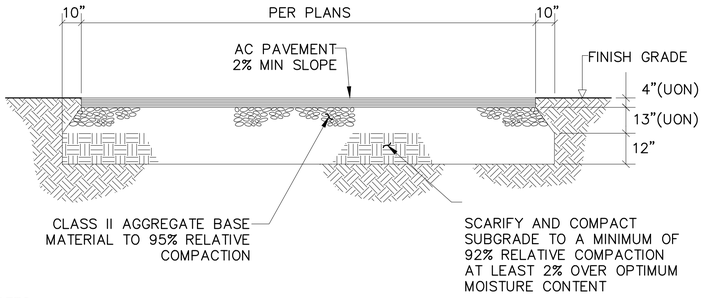
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
CIVIL
1W AND 3W POINT OF CONNECTION DETAILS

SHEET
C-14

19 OF 55

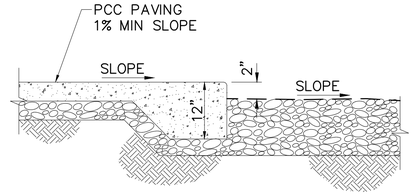
3.4"x22" ORIGINAL SCALE IN INCHES

P:\101 Engineering\Petaluma, City of\15219_ECWRF Chemical System Upgrade\6-CAD\15219 SH19 C-14 1W 3W Detail.dwg 04/29/2024 16:45



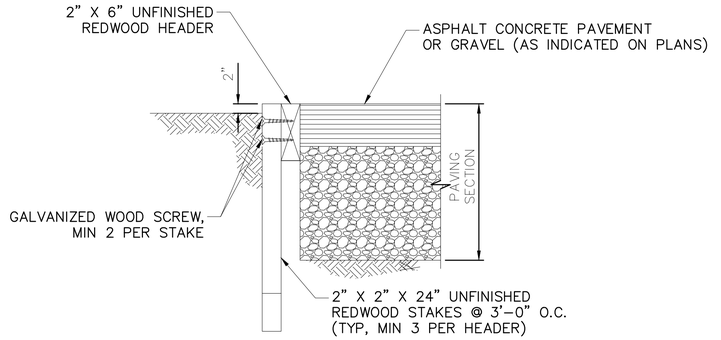
NOTES:
1. SEE SPECIFICATION SECTION 02510 FOR ASPHALT CONCRETE PAVEMENT REQUIREMENTS

ASPHALT CONCRETE PAVING SECTION — NOT TO SCALE — 1 VAR

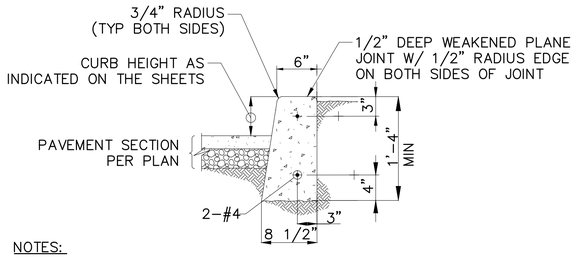


NOTES:
1. PCC PAVEMENT SHALL BE CONTINUOUSLY REINFORCED WITH NO. 4 BARS SPACED NO MORE THAN 18" ON CENTER IN BOTH DIRECTIONS

PCC PAVING EDGE SECTION — NOT TO SCALE — 2 VAR



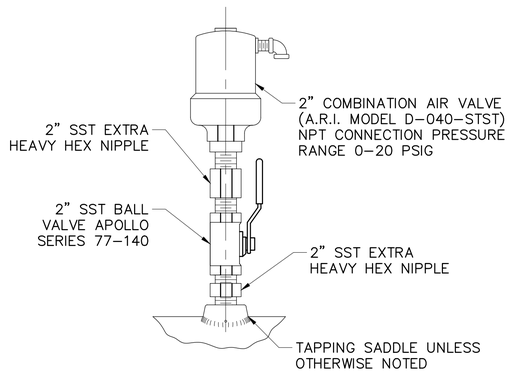
REDWOOD HEADER AT AC PAVING — NOT TO SCALE — 3 VAR



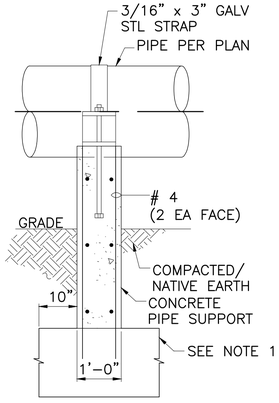
NOTES:

1. EXPANSION JOINTS SHALL BE PLACED AT END OF CONCRETE PLACEMENT, AT POINTS OF CURVATURE, BOTH SIDES OF DRIVEWAYS AND WALKWAYS, CURB RETURNS, STRUCTURES, AND AT MAXIMUM DISTANCE OF 30 FEET. EXPANSION JOINTS SHALL BE 3/4" THICK W/ 1/4" RADIUS EDGES AT BOTH SIDES OF JOINT. USE BITUMINOUS EXPANSION JOINT MATERIAL.
2. REINFORCING STEEL SHALL NOT PASS THROUGH EXPANSION JOINTS.
3. WEAKENED PLANE JOINTS SHALL BE INSTALLED AT 15 FEET OC.
4. CURB SHALL BE EMBEDDED A MINIMUM OF 2" BELOW AGGREGATE BASE LAYER.

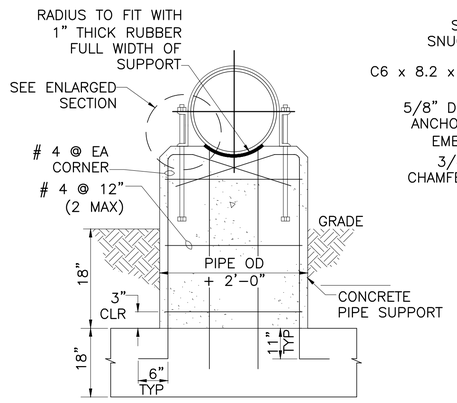
YARD CURBING DETAIL — NOT TO SCALE — 4 VAR



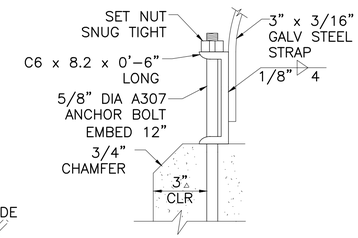
COMBINED AIR VALVE ASSEMBLY DETAIL — NOT TO SCALE — 5 VAR



ELEVATION



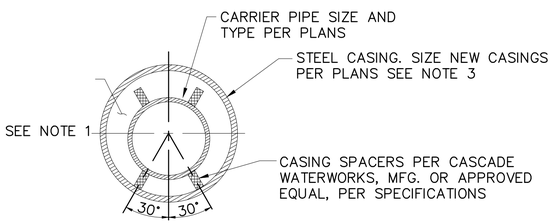
SECTION



ENLARGED SECTION

NOTES:
1. CONSTRUCT 18" THICK SLAB EXTENDING 10" IN ALL DIRECTIONS BEYOND FOOTPRINT OF THE PIPE SUPPORT. SLAB SHALL HAVE #5 @ 12" EACH FACE, TOP AND BOTTOM

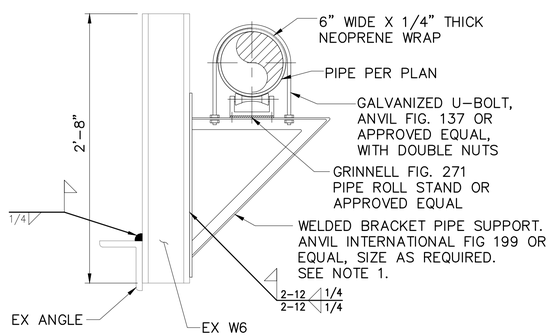
CONCRETE PIPE SUPPORT DETAIL — NOT TO SCALE — 6 VAR



NOTES

1. CASING TO BE FILLED W/ AIR BLOWN SAND UNLESS OTHER WISE NOTED.
2. MAXIMUM DISTANCE BETWEEN CASING SPACERS SHALL BE 5-FT. (PROVIDE ADDITIONAL SPACERS PER MANUFACTURER'S RECOMMENDATION AT NO ADDITIONAL COST TO OWNER).
3. CASING SHALL BE WELDED STEEL PIPE IN COMPLIANCE WITH ASTM A53, GRADE B. MINIMUM WALL THICKNESS IS 3/8 INCH. COAT INTERIOR AND EXTERIOR SURFACES WITH FACTORY-APPLIED FUSION-BONDED EPOXY COATING PER AWWA C213. APPLY FOLLOWING TO THE EXTERIOR OF THE PIPE: 2.5-3.5 MIL DRY FILM THICKNESS OF ZINC RICH PRIMER PER AASHTO M 300 AND 2.0-3.0 MIL DRY FILM THICKNESS OF LATEX SATIN OR FLAT FINISH PAINT COMPLYING WITH STATE VOC REQUIREMENTS.

PIPE CASING DETAIL — NOT TO SCALE — 7 VAR



NOTES

1. MATCH EXIST COATING SYSTEM, 4-6 MILS CARBOGUARD 890N PRIMER AND 3-5 MILS CARBOTHANE 134 TOPCOAT OR APPROVED EQUAL.

PIPE SUPPORT W/ ROLLER DETAIL — NOT TO SCALE — 8 VAR

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024 | DESIGNED BY: A. HESS | DRAWN BY: N. HUNTER | CHECKED BY: M. METTS

PROJECT NO.
C66501840



CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH: 707-778-4546 FAX: 707-778-4508

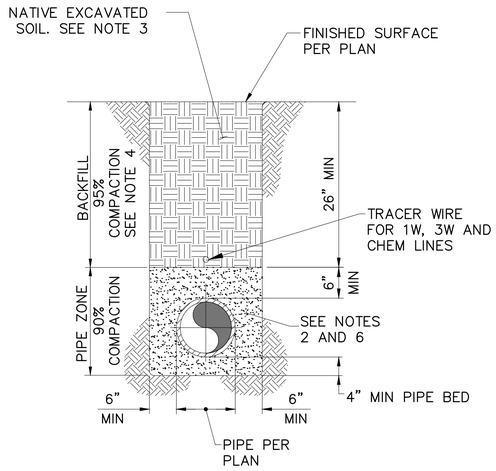
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
CIVIL
DETAILS - 1

SHEET
C-15

20 OF 55

34"x22" ORIGINAL SCALE IN INCHES

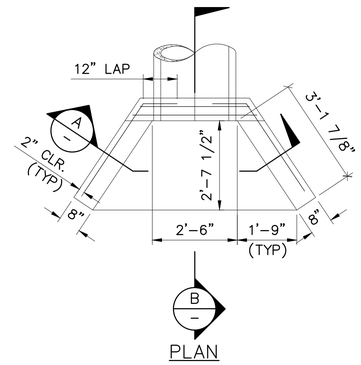
P:\101 Engineering\Petaluma, City of\15219_ECWRF Chemical System Upgrade\6-CAD\15219 SH20 to 21 C-15 to C-16 Details.dwg 04/29/2024 16:46

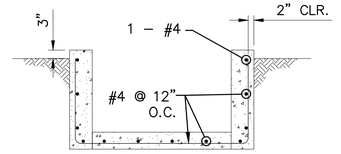


NOTES:

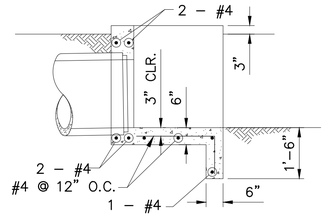
1. TYPICAL FOR ALL PIPING SHOWN ON CIVIL PLANS.
2. PROVIDE SAND WITH A SAND EQUIVALENT OF 30 OR GREATER AND A PERMEABILITY OF 1.4 IN/HR OR GREATER.
3. REMOVE ALL ORGANIC MATERIAL, RUBBISH, DEBRIS, AND ROCKS GREATER THAN THREE INCHES IN DIAMETER.
4. IF NATIVE SOIL IS USED FOR BACKFILL, COMPACT TO A MINIMUM OF 88% COMPACTION AT LEAST 2% OVER OPTIMUM MOISTURE CONTENT.
5. TRENCH BACKFILL SHALL BE PLACED IN MAXIMUM 12-INCH LIFTS.
6. 1W AND 3W PIPES LAID IN SAME TRENCH SHALL HAVE 12-INCH MINIMUM VERTICAL AND HORIZONTAL SEPARATION PER PLUMBING CODE SECTION 1505.11

TRENCH DETAIL 1 VAR
NOT TO SCALE

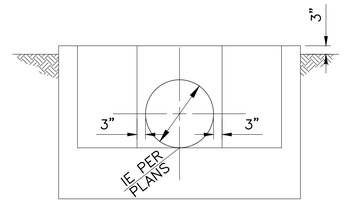




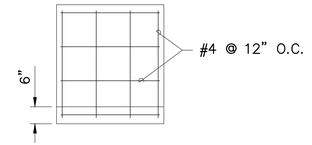
SECTION A



SECTION B



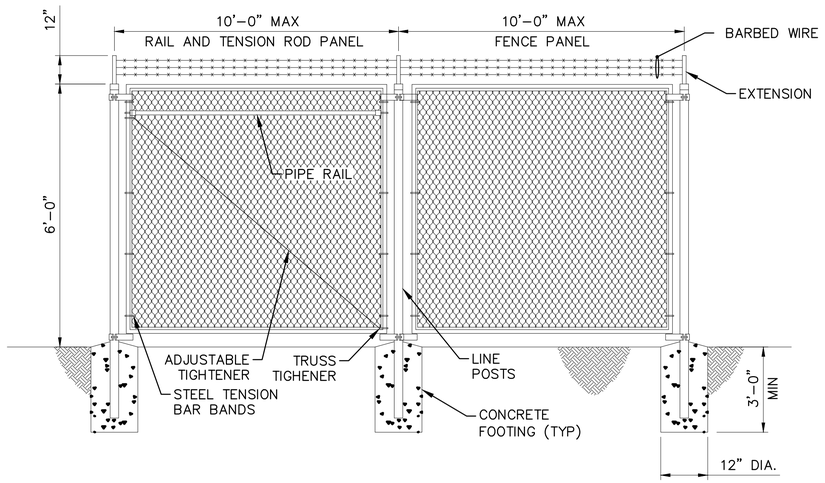
ELEVATION



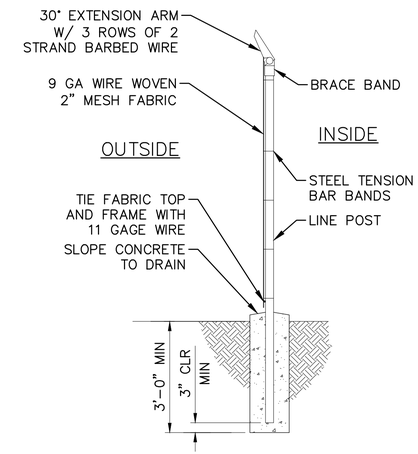
WING WALL REINFORCING

WING HEADWALL DETAIL 2 VAR
NOT TO SCALE

NOT USED 3 VAR
NOT TO SCALE



BARBED WIRE FENCE DETAIL 4 VAR
NOT TO SCALE



SECTION

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024 | DESIGNED BY: A. HESS | DRAWN BY: N. HUNTER | CHECKED BY: M. METTS

PROJECT NO.
C66501840



CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH: 707-778-4546 FAX: 707-778-4508

SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
CIVIL
DETAILS - 2

SHEET
C-16

21 OF 55

3.4"x22" ORIGINAL SCALE IN INCHES

P:\101 Engineering\Petaluma, City of\15219_EC\WRF Chemical System Upgrade\6-CAD\15219 SH20 to 21 C-15 to C-16 Details.dwg 04/29/2024 16:47

DESIGN BASIS :

1. APPLICABLE CODES:

2022 CBC	CALIFORNIA BUILDING CODE
ASCE 7–16	MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES

2. DEAD LOADS: AS CALCULATED

3. LIVE LOADS:

FLOOR	125 PSF
ROOF	20 PSF (REDUCIBLE)

4. WIND DESIGN DATA:

ULTIMATE WIND SPEED	V_{ult} = 99 MPH
BASIC WIND SPEED	V_{asd} = 77 MPH
RISK CATEGORY	III
EXPOSURE	C

5. EARTHQUAKE DESIGN DATA:

SEISMIC DESIGN CATEGORY	D
SITE CLASS	D
RISK CATEGORY	III
SEISMIC IMPORTANCE FACTOR	I_e = 1.25
SPECTRAL PARAMETERS (SITE SPECIFIC)	S_s = 1.847g S_1 = 0.704g S_{MS} = 1.690g S_{M1} = 1.410g S_{DS} = 1.130g S_{D1} = 0.940g

6. BUILDING/STRUCTURE DESIGN PARAMETERS

A. CHEMICAL AREA CANOPY LATERAL FORCE RESISTING SYSTEM	(FUTURE CONSTRUCTION) SPECIAL STEEL CANTILEVER COLUMN
ANALYSIS PROCEDURE	EQUIVALENT LATERAL FORCE
RESPONSE MODIFICATION FACTOR	R = 2.50
OVERSTRENGTH FACTOR	Ω_o = 1.25
DEFLECTION AMPLIFICATION FACTOR	C_d = 2.50
SEISMIC RESPONSE COEFFICIENT	C_s = 0.565
REDUNDANCY FACTOR	ρ = 1.30
MAXIMUM ROOF WEIGHT:	w_r = 18 PSF
MAXIMUM WALL WEIGHT:	w_w = 8 PSF
MAXIMUM ROOF HEIGHT:	h_r = 20 FT

7. SOIL DESIGN PARAMETERS

A. LATERAL EARTH PRESSURES

EARTH PRESSURES	EQUIVALENT FLUID PRESSURES (PCF)[1]	
	ABOVE WATER[2]	BELOW WATER[2]
ACTIVE (FLEXIBLE WALLS)	45	85[3]
AT–REST (RIGID WALLS)	60	90[3]
SEISMIC (FLEXIBLE WALLS)	27[4]	13[4]
SEISMIC (RIGID WALLS)	47[4]	23[4]

1. THE LATERAL EARTH PRESSURES PRESENTED HEREIN ARE APPLICABLE FOR LEVEL BACKFILL UP TO 6H:1V.
2. DESIGN GROUNDWATER IS AT A DEPTH OF 5 FEET BGS (REFERENCED TO THE CREST OF THE EXISTING OXIDATION POND LEVEES).
3. INCLUDES HYDROSTATIC PRESSURE.
4. ONLY APPLICABLE FOR WALLS RETAINING MORE THAN 6 FEET OF SOIL/BACKFILL.

B. VEHICULAR SURCHARGE — 100 PSF (ACTIVE) 150 PSF(AT–REST)

C. SOIL PASSIVE PRESSURE — 300 PSF/FT

D. SOIL COEFFICIENT OF SLIDING FRICTION — 0.30

E. MAXIMUM GROUNDWATER ELEVATION — 5.00 FT BGS

8. CIDH PILE DESIGN PARAMETERS

DIAMETER	MINIMUM EMBED BGS	ULTIMATE CAPACITY	DOWNDRAG	STATIC CAPACITY	TRANSIENT CAPACITY
(IN)	(FT)	(KIPS)	(KIPS)	(KIPS)	(KIPS)
18	50	200.0	52.5	47.3	80.5

A. STATIC CAPACITY = (ULTIMATE CAPACITY/2.0) – DOWNDRAG

B. TRANSIENT CAPACITY = (ULTIMATE CAPACITY/1.5) – DOWNDRAG

STRUCTURAL OBSERVATION :

1. PER CBC CHAPTER 17 SECTION 1704.6, THE CITY SHALL EMPLOY A LICENSED ENGINEER RESPONSIBLE FOR THE STRUCTURAL DESIGN, OR HIS DESIGNATED ENGINEER TO MAKE SITE VISITS TO OBSERVE GENERAL COMPLIANCE WITH THE APPROVED STRUCTURAL PLANS, SPECIFICATIONS AND CHANGE ORDERS. THE ENGINEER SHALL SUBMIT A STATEMENT IN WRITING TO THE CITY STATING THAT THE SITE VISIT HAS BEEN MADE AND THAT ANY DEFICIENCIES NOTED HAVE BEEN CORRECTED. STRUCTURAL OBSERVATION DOES NOT INCLUDE OR WAIVE THE INSPECTIONS REQUIRED BY SECTIONS 110, 1704, 1705, OR OTHER SECTIONS OF THE CODE.THE CONTRACTOR SHALL NOTIFY THE ENGINEER 72 HOURS PRIOR TO THE COMPLETION OF ANY WORK THAT REQUIRES OBSERVATIONS. STRUCTURAL OBSERVATIONS ARE REQUIRED FOR THE FOLLOWING WORK PERFORMED BY THE CONTRACTOR:

   a. 50% OF FOUNDATION REINFORCEMENT.
   b. 50% OF WALL REINFORCEMENT.
   c. 50% OF CIDH PILE REINFORCEMENT AND CONCRETE PLACEMENT.
   d. 100% FRP TANK ANCHORS

SHOP DRAWINGS/SUBMITTALS :

1. PRIOR TO FABRICATION SUBMIT AS A MINIMUM THE FOLLOWING SHOP SUBMITTALS TO THE ENGINEER FOR REVIEW AND COMMENT:

   a. STEEL FRAMING

   b. WELDING PROCEDURES

   c. MIX DESIGN FOR:

      I. CONCRETE

   d. REINFORCING BAR LAYOUT FOR:

      I. CONCRETE

2. STEEL REINFORCING LISTS, QUANTITIES AND LENGTHS OF ALL MATERIALS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO ASSURE COMPLIANCE WITH THE PLANS. THE ENGINEER WILL NOT REVIEW THESE ITEMS.

3. REVIEW OF SHOP DRAWINGS BY THE STRUCTURAL ENGINEER IS FOR THE PURPOSE OF GENERAL COMPLIANCE WITH THE CONTRACT DOCUMENTS. ALL ERRORS IN DETAILING, FABRICATION, AND FOR CORRECT FITTING OF ALL STRUCTURAL MEMBERS INCLUDING COORDINATION WITH OTHER TRADES SHALL REMAIN THE RESPONSIBILITY OF THE CONTRACTOR. SHOP DRAWING SUBMITTALS PROCESSED BY THE ENGINEER DO NOT CONSTITUTE CHANGE ORDERS. ANY PROPOSED CHANGES MUST BE SUBMITTED IN A LETTER OR DETAIL TO THE ENGINEER FOR APPROVAL.

4. ELECTRONIC SHOP DRAWINGS SHALL BE SUBMITTED AT LEAST TWO WEEKS PRIOR TO THE SCHEDULED FABRICATION DATE. ONE SET CLEARLY MARKED WITH ANY COMMENTS WILL BE RETURNED TO THE CONTRACTOR.

5. REPRODUCTION OF THESE STRUCTURAL DRAWINGS IS PROHIBITED FOR THE PURPOSE OF PREPARING SHOP DRAWINGS. SUBCONTRACTOR/FABRICATOR IS TO PROVIDE INDEPENDENTLY CREATED DRAWINGS BASED ON THE INFORMATION SHOWN IN THE CONTRACT DOCUMENTS.

DEFERRED APPROVALS :

1. THE FOLLOWING COMPONENTS REQUIRE DEFERRED APPROVAL BY THE GOVERNING AGENCY. STRUCTURAL CALCULATIONS AND DRAWINGS SIGNED AND SEALED BY A CALIFORNIA REGISTERED CIVIL OR STRUCTURAL ENGINEER SHALL BE SUBMITTED BY THE CONTRACTOR TO THE ENGINEER FOR REVIEW AND TO THE GOVERNING AGENCY FOR PERMIT.

   A. FRP STAIRS AND PLATFORMS

2. IN ADDITION TO THE SEAL OF THE RESPONSIBLE ENGINEER, DEFERRED SUBMITTAL PACKAGES SHALL BEAR THE SHOP DRAWING APPROVAL STAMPS OF THE STRUCTURAL ENGINEER AND THE GENERAL CONTRACTOR.

3. CALCULATIONS AND DRAWINGS FOR THE DEFERRED SUBMITTAL ITEMS SHALL BE SUBMITTED SUFFICIENTLY IN ADVANCE OF THE DESIRED DATE OF APPROVAL TO PROVIDE TIME FOR THE INITIAL REVIEW BY THE CITY AND AT LEAST ONE CYCLE OF RESPONSE AND BACK CHECK REVIEW.

4. DEFERRED SUBMITTAL ITEMS SHALL NOT BE FABRICATED PRIOR TO APPROVAL BY THE GOVERNING AGENCY OF THE CALCULATIONS AND DRAWINGS.

ABBREVIATIONS:

&	AND	KIPS	KILOPOUNDS (1,000 POUNDS)
@	AT	KO	KNOCK OUT
℄	CENTER LINE	LB	POUND
ℙ	PLATE, PROPERTY LINE	LB	LAG BOLT
AB	ANCHOR BOLT	LF	LINEAR FOOT
ADJ	ADJACENT	LG	LONG
AFF	ABOVE FINISH FLOOR	LL	LIVE LOAD
ARCH	ARCHITECTURAL	LLH	LONG LEG HORIZONTAL
BD	BAR DIAMETER	LLV	LONG LEG VERTICAL
BGS	BELOW GROUND SURFACE	LT	LIGHT
BLDG	BUILDING	MAS	MASONRY
BLK	BLOCK	MAT	MATERIAL
BLKG	BLOCKING	MAX	MAXIMUM
BLW	BELOW	MECH	MECHANICAL
BM	BEAM	MIN	MINIMUM
(B) OR BOT	BOTTOM	MANUF	MANUFACTURER
BRG	BEARING	MTL	METAL
BS	BOTH SIDES	(N)	NEW
BTWN	BETWEEN	NS	NEAR SIDE
CBC	CALIFORNIA BUILDING CODE	NIC	NOT IN CONTRACT
CF	CUBIC FOOT	NOM	NOMINAL
CHAM	CHAMFER	NTS	NOT TO SCALE
CIP	CAST–IN–PLACE	OC	ON CENTER
CJ	CONSTRUCTION JOINT	OD	OUTSIDE DIAMETER
CJP	COMPLETE JOINT PENETRATION	OH	OPPOSITE HAND
CLG	CEILING	OPNG	OPENING
CLK	CAULK	OPP	OPPOSITE
CLKG	CAULKING	PC	PRECAST
CLR	CLEAR	PERP	PERPENDICULAR
CMU	CONCRETE MASONRY UNIT	PL OR (ℙ)	PLATE
CNTR	CENTER	PREFAB	PREFABRICATED
COL	COLUMN	PSF	POUNDS PER SQUARE FOOT
CONC	CONCRETE	PSI	POUNDS PER SQUARE INCHES
CONN	CONNECTION	PT.	POINT
CONT	CONTINUOUS	PVC	POLYVINYL CHLORIDE
DBL	DOUBLE	RAD	RADIUS
DEP	DEPRESSED	RD	ROOF DRAIN
DET	DETAIL	REF	REFERENCE
DIA	DIAMETER	REINF	REINFORCED / REINFORCING
DIAG	DIAGONAL	REQD	REQUIRED
DIM	DIMENSION	REV	REVISION
DL	DEAD LOAD	RF	ROOF
DN	DOWN	RH	ROOF HATCH
DIV	DIVISION	RM	ROOM
DR	DOOR	SCHED	SCHEDULE
DWG	DRAWING	SECT	SECTION
DWL	DOWEL	SF	SQUARE FOOT
(E)	EXISTING	SHT	SHEET
EA	EACH	SHTHG	SHEATHING
EF	EACH FACE	SIM	SIMILAR
EJ	EXPANSION JOINT	SMS	SHEET METAL SCREW
EL	ELEVATION	SOG	SLAB ON GRADE
EMBED	EMBEDMENT	SPEC	SPECIFICATION
EQ	EQUAL	SQ	SQUARE
EQUIP	EQUIPMENT	SS	STAINLESS STEEL
ES	EACH SIDE	SST	STAINLESS STEEL
EW	EACH WAY	STGR	STAGGERED
EXP	EXPANSION	STD	STANDARD
EXT	EXTERIOR	STIFF	STIFFENER
FD	FLOOR DRAIN	STL	STEEL
FDN	FOUNDATION	STRUCT	STRUCTURAL
FF	FINISH FLOOR	SYM	SYMMETRICAL
FIN	FINISH	SYS	SYSTEM
FLR	FLOOR	T&B	TOP AND BOTTOM
FO	FACE OF	TEMP	TEMPORARY
FRMG	FRAMING	THK	THICK
FS	FAR SIDE	THKND	THICKENED
FT	FEET / FOOT	THRU	THROUGH
FTG	FOOTING	TL	TOTAL LOAD
GA	GAUGE	T.O.	TOP OF
GALV	GALVANIZED	TYP	TYPICAL
GRD	GRADE	UFC	UNIFIED FACILITIES CRITERIA
GYP	GYPSUM	UON	UNLESS OTHERWISE NOTED
HDR	HEADER	VERT OR (V)	VERTICAL
HGR	HANGER	V.I.F	VERIFY IN FIELD
HORIZ	HORIZONTAL	W/	WITH
HSB	HIGH STRENGTH BOLT	W/O	WITHOUT
HT	HEIGHT	WCJ	WALL CONTROL JOINT
HVAC	HEATING, VENTILATION, & AIRCONDITIONING	WHS	WELDED HEADED STUD
		WIN	WINDOW
IBC	INTERNATIONAL BUILDING CODE	WP	WATERPROOF / WORK POINT
IN	INCH	WPJ	WEAKENED PLANE JOINT
INSP	INSPECTION / INSPECTOR	WT	WEIGHT
INT	INTERIOR	WWF	WELDED WIRE FABRIC
JST	JOIST	WWM	WELDED WIRE MESH
JT	JOINT		

SYMBOLS :

GRID NO. A — GRID LINES – CENTER LINE

GRID NO. A — GRID LINES – F.O. STUD/WALL

DETAIL NO. 1 / S-1 — SHEET NO. WHERE DETAIL IS SHOWN — DETAIL BUBBLE

ELEVATION NO. 1 / S-1 — SHEET NO. WHERE ELEVATION IS SHOWN — ELEVATION

SECTION NO. 1 / S-1 — SHEET NO. WHERE SECTION IS SHOWN — SECTION

KELLEY STRUCTURAL ENGINEERING, INC. 6098 ALDEN AVE. NO. 1726 SANTA ROSA, CA 95405 619.920.1282 www.kelleystructural.com

DATE: 04/29/2024 | DESIGNED BY: MS | DRAWN BY: AM | CHECKED BY: DI

PROJECT NO. C66501840

REGISTERED PROFESSIONAL ENGINEER — MINNESOTA — 60981 — KELLEY — STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
STRUCTURAL
GENERAL NOTES - 1

SHEET S-1

22 OF 55

34"x22" ORIGINAL SCALE IN INCHES 0 1 2

Z:\Shared\CAD\110 - Dudek\38 - City of Petaluma EQ\RF Chemical System Upgrade\Final\DETAILS\15219 S-1 4/29/2024 4:50 PM

GENERAL NOTES :

1. THE PROJECT SPECIFICATIONS SHALL BE PART OF THE CONTRACT DOCUMENTS.
2. THE STRUCTURAL DRAWINGS ARE TO BE USED IN CONJUNCTION WITH MECHANICAL, CIVIL AND ELECTRICAL DRAWINGS. NO PORTION OF STRUCTURAL RELATED WORK, INCLUDING SHOP DRAWING DEVELOPMENT, SHALL BE PERFORMED WITHOUT CONSIDERING REQUIREMENTS OF CONTRACT DOCUMENTS IN THEIR ENTIRETY.
3. DETAILS AND SCHEDULES INDICATED AS "TYPICAL" MAY NOT BE SPECIFICALLY REFERENCED ON DRAWINGS. DETERMINE WHERE EACH TYPICAL DETAIL OR SCHEDULE APPLIES BEFORE PROCEEDING WITH WORK. IF CONDITIONS ARE FOUND WHICH ARE NOT SPECIFICALLY DETAILED AND NO TYPICAL DETAIL OR SCHEDULE APPLIES PROMPTLY NOTIFY THE STRUCTURAL ENGINEER.
4. OPENINGS, POCKETS, CORE DRILLING, ETC. SHALL NOT BE PLACED IN STRUCTURAL WALLS, SLABS, AND MEMBERS UNLESS SPECIFICALLY DETAILED ON THE STRUCTURAL DRAWINGS. NOTIFY THE STRUCTURAL ENGINEER OF RECORD WHEN DRAWINGS BY OTHERS INDICATE OPENINGS, POCKETS, CORE DRILLING, ETC., NOT INDICATED ON THE STRUCTURAL DRAWINGS, BUT WHICH ARE LOCATED IN STRUCTURAL MEMBERS.
5. THE CONTRACTOR SHALL REVIEW EXISTING CONDITIONS ON THE SITE DURING THE BIDDING. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS PRIOR TO STARTING WORK. THE STRUCTURAL ENGINEER SHALL BE NOTIFIED OF ANY DISCREPANCIES OR INCONSISTENCIES PRIOR TO PROCEEDING.
6. UNLESS NOTED OR SHOWN OTHERWISE, ALL PHASES OF WORK ARE TO CONFORM TO THE MINIMUM STANDARDS OF THE CALIFORNIA BUILDING CODE (LATEST EDITION), AND ANY ASTM SPECIFICATIONS ON WHICH THESE STANDARDS ARE BASED. WHERE CONFLICT BETWEEN BUILDING CODES AND SPECIFICATIONS OCCUR, THE MOST STRINGENT REQUIREMENTS SHALL GOVERN.
7. ALL ASTM DESIGNATIONS REFERRED TO ON THESE DRAWINGS SHALL BE THE LATEST ADOPTED OR REVISED SPECIFICATION, AS OF THE DATE OF THESE DRAWINGS.
8. ALL FIGURE AND DIMENSION CALLOUTS SHALL TAKE PRECEDENCE OVER SCALE SHOWN ON PLANS, SECTIONS AND DETAILS.
9. NOTES AND DETAILS ON THE DRAWINGS SHALL TAKE PRECEDENCE OVER GENERAL NOTES AND TYPICAL DETAILS.
10. THE STRUCTURAL DRAWINGS SHOW ONLY THE BASIC STRUCTURAL REQUIREMENTS. REFER TO CIVIL, MECHANICAL AND ELECTRICAL DRAWINGS FOR NON-STRUCTURAL ITEMS, SUCH AS:
    A. SIZE AND LOCATION OF ALL OPENINGS.
    B. SIZE AND LOCATION OF ALL CONCRETE CURBS, WALKS, ROOF AND FLOOR DRAINS, SLOPES, DEPRESSED SLAB AREAS, ETC.
    C. FLOOR, ROOF AND WALL FINISHES.
    D. DIMENSIONS WHICH ARE NOT SHOWN ON STRUCTURAL DRAWINGS.
11. THE STRUCTURAL CONTRACT DOCUMENTS AND SPECIFICATIONS REPRESENT THE FINISHED STRUCTURE. UNLESS OTHERWISE NOTED, THEY DO NOT INDICATE THE METHOD OF CONSTRUCTION.
12. THE CONTRACTOR SHALL, AT HIS OWN EXPENSE, DESIGN, CONSTRUCT AND MAINTAIN ALL SAFETY DEVICES, INCLUDING SHORING AND BRACING AND SHALL BE SOLELY RESPONSIBLE FOR CONFORMING TO ALL LOCAL, STATE AND FEDERAL SAFETY AND HEALTH STANDARDS, LAWS AND REGULATIONS. SITE OBSERVATION VISITS BY THE STRUCTURAL ENGINEER OF RECORD SHALL NOT INCLUDE INSPECTION OF THE ABOVE SAFETY ITEMS.
13. SATISFACTORY EXECUTION OF CONSTRUCTION IS DEPENDENT UPON CONFORMANCE WITH THE INTENT OF THESE DRAWINGS. THE GOVERNING JURISDICTION OR CONTRACTOR SHALL RETAIN A CALIFORNIA LICENSED CIVIL OR STRUCTURAL ENGINEER DURING CONSTRUCTION TO OBSERVE THE CONSTRUCTION AND STATE THAT THE STRUCTURE HAS BEEN BUILT IN GENERAL CONFORMANCE WITH THE INTENT OF THESE DRAWINGS.
14. CONSTRUCTION MATERIALS SHALL BE SPREAD OUT IF PLACED ON WET WELL ROOF SLABS. LOAD SHALL NOT EXCEED DESIGN LIVE LOAD FOR EACH PARTICULAR LEVEL. WHEN WEIGHT OF MATERIALS OR EQUIPMENT MAY EXCEED DESIGN LOAD, STRUCTURAL SYSTEMS SHALL BE SHORED.
15. WHERE NO CONSTRUCTION DETAILS ARE SHOWN OR NOTED FOR ANY PART OF THE WORK. THE DETAILS SHALL BE THE SAME AS FOR OTHER SIMILAR WORK.

FOUNDATION :

1. SOILS REPORT SHALL BE PART OF THE CONTRACT DOCUMENTS. PRIOR TO THE POURING OF CONCRETE FOUNDATIONS AND PRIOR TO THE CONTRACTOR REQUESTING A DISTRICT FOUNDATION INSPECTION, THE GEOTECHNICAL ENGINEER SHALL INSPECT AND APPROVE THE FOUNDATION EXCAVATIONS. HE SHALL POST NOTICE ON THE JOB SITE AND ADVISE THE DISTRICT IN WRITING THAT THE WORK SO INSPECTED MEETS THE CONDITIONS OF THE REPORT. HE SHALL PROVIDE WRITTEN CERTIFICATION TO VERIFY THAT:
    A. THE STRUCTURE SUBGRADE WAS PREPARED IN ACCORDANCE WITH THE SOILS REPORT.
    B. THE UTILITY TRENCHES HAVE BEEN PROPERLY BACKFILLED AND COMPACTED.
    C. THE FOUNDATION EXCAVATIONS COMPLY WITH THE INTENT OF THE SOILS REPORT.
2. SOILS REPORT PREPARED BY: BSK ASSOCIATES
   TITLE : GEOTECHNICAL INVESTIGATION REPORT
   CHEMICAL SYSTEM UPGRADE
   ELLIS CREEK WATER RECYCLING FACILITY
   PETALUMA, CA
   BSK PROJECT NO. G00000357

   DATED : JUNE 27, 2023.
3. SOIL REMOVAL, BACKFILLING, AND RECOMPACTION SHALL BE PERFORMED PER SOILS REPORT RECOMMENDATIONS UNDER GEOTECHNICAL ENGINEER'S SUPERVISION AND INSPECTION.
4. FOUNDATIONS SHALL BE OF THE FOLLOWING TYPE:
    A. SHALLOW FOOTING SYSTEM: MINIMUM EMBEDMENT 24" BELOW LOWEST ADJACENT GRADE.
    B. MAT SLAB FOUNDATION.
    C. CIDH PILES
5. DESIGN SOIL PRESSURES:

FOUNDATION TYPE	STATIC BEARING PRESSURE
MAT SLAB	500 PSF
SPREAD FOOTING	1,000 PSF

   ALLOWABLE BEARING CAPACITIES MAY BE INCREASED BY ONE-THIRD WHEN CONSIDERING LOADS OF SHORT DURATION SUCH AS WIND OR SEISMIC FORCES.
6. MAT SLAB FOUNDATIONS SHALL BE UNDERLAIN BY A 15-MIL VAPOR RETARDER OVER 6-INCH THICK CAPILLARY BREAK LAYER CONSISTING OF 3/4" CRUSHED ROCK CONFORMING TO REQUIREMENTS OF ASTM C33 COURSE AGGREGATE NO. 6.
7. FOOTING ELEVATIONS SHALL BE LOCATED SUCH THAT THEIR BEARING IS A MINIMUM HORIZONTAL DISTANCE OF 7 FEET FROM THE DAYLIGHT OF AN ADJACENT SLOPE.
8. FOUNDATION EXCAVATIONS, FILLING, AND COMPACTION ARE TO BE OBSERVED BY AND DEEMED ACCEPTABLE TO THE GEOTECHNICAL ENGINEER OR THEIR REPRESENTATIVE PRIOR TO PLACEMENT OF REINFORCING STEEL OR CONCRETE.
9. CIDH PIER HOLES DEEPER THAN 7 FEET SHALL BE EITHER TEMPORARILY CASED DURING INSTALLATION OR BE DRILLED USING THE SLURRY DISPLACEMENT METHOD. THE CONTRACTOR SHALL PREPARE A SUBMITTAL DESCRIBING THE EQUIPMENT, PROCEDURES, AND MATERIALS TO BE USED FOR INSTALLATION OF THE CIDH PIERS. THIS SUBMITTAL SHALL BE SUBJECT TO REVIEW AND APPROVAL BY THE ENGINEER OF RECORD AND THE GEOTECHNICAL ENGINEER.
10. ALL EXCAVATIONS SHALL BE PROPERLY BACKFILLED. DO NOT PLACE BACKFILL BEHIND RETAINING WALLS BEFORE WALLS HAVE ATTAINED FULL DESIGN STRENGTH. CONTRACTOR SHALL BRACE OR PROTECT ALL BUILDING AND PIT WALLS BELOW GRADE FROM LATERAL LOADS UNTIL ATTACHING FLOORS ARE COMPLETELY IN PLACE AND HAVE ATTAINED FULL STRENGTH. CONTRACTOR SHALL PROVIDE FOR DESIGN, PERMITS AND INSTALLATION OF SUCH BRACING.
11. SLAB BASE AND COMPACTION TO BE IN ACCORDANCE WITH SOILS REPORT.
12. NO PIPES OR DUCTS SHALL BE PLACED IN SLABS OR WALLS UNLESS SPECIFICALLY DETAILED OR APPROVED BY THE STATE'S REPRESENTATIVE.
13. FOR ALL DIMENSIONS, CURBS, SLAB DEPRESSIONS, STEPS, TRENCHES, CONDUITS, SEE MECHANICAL AND ELECTRICAL DRAWINGS.
14. ALL WALLS RETAINING EARTH SHALL DRAIN TO DAYLIGHT OR OTHER DRAINAGE.
15. ALL ABANDONED FOOTINGS, UTILITIES, ETC., THAT INTERFERE WITH NEW CONSTRUCTION SHALL BE REMOVED.
16. THE CONTRACTOR SHALL PROVIDE FOR DESIGN, APPROVALS, PERMITS, INSTALLATION AND MONITORING OF ALL CRIBBING, SHEATHING AND SHORING REQUIRED TO SAFELY RETAIN TEMPORARY EXCAVATIONS.

FOUNDATION (CONTINUED) :

17. THE CONTRACTOR SHALL DETERMINE THE LOCATION OF UTILITY SERVICE IN AREAS TO BE EXCAVATED BEFORE BEGINNING EXCAVATION. EXERCISE EXTREME CAUTION IN EXCAVATING AND TRENCHING. DAMAGE CAUSED AS A RESULT OF FAILING TO EXACTLY LOCATE AND PRESERVE ALL EXISTING UNDERGROUND UTILITIES ARE THE RESPONSIBILITY OF THE CONTRACTOR.

CONCRETE :

1. CONCRETE CONSTRUCTION SHALL CONFORM TO CHAPTER 19 OF THE CALIFORNIA BUILDING CODE, ACI 318 "BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE" (LATEST EDITIONS), EXCEPT AS MODIFIED BY THE SUPPLEMENTAL AND ACI 350 "CODE REQUIREMENTS FOR ENVIRONMENTAL ENGINEERING CONCRETE STRUCTURES" CONTAINED HEREIN OR SHOWN ON THE DRAWINGS.
2. SCHEDULE OF STRUCTURAL CONCRETE, 28 DAY STRENGTHS AND MIX DESIGN REQUIREMENTS:

CONCRETE LOCATION :	STRENGTH (PSI)	TEST AGE (DAYS)	MAX AGGREGATE SIZE	MAX W/C RATIO	MAX SLUMP
ALL CONCRETE UON	4,000	28	1"	0.45	4" ± 1"
CIDH PIERS	3,000	28	3/8"	0.50	8" ± 2"
SITEWORK CONCRETE	3,000	28	3/8"	0.50	4" ± 1"

3. PEA GRAVEL SHALL NOT BE USED FOR STRUCTURAL CONCRETE, UON OR APPROVED BY THE ENGINEER.
4. CEMENT SHALL CONFORM TO ASTM C150, TYPE II/V, LOW ALKALI. AGGREGATES FOR NORMAL WEIGHT SHALL CONFORM TO ASTM C33.
5. ADMIXTURES AND COLORS (EXCEPT AS NOTED HEREIN) SHALL NOT BE USED UNLESS SUBSTANTIATING DATA IS SUBMITTED TO AND REVIEWED BY THE ENGINEER OF RECORD.
6. CONCRETE MIXES SHALL BE DESIGNED BY A QUALIFIED TESTING LABORATORY. THE MIX DESIGNS SHALL CONFORM TO CBC CHAPTER 19 UNLESS OTHERWISE NOTED.
7. NON-STRUCTURAL STEEL EMBEDDED IN CONCRETE SHALL BE GALVANIZED OR PAINTED. ALL DAMAGED GALVANIZED AREAS SHALL BE REPAIRED PRIOR TO EMBEDMENT.
8. PROVIDE 2- #5 DIAGONAL BARS AT CORNERS OF WALL, FLOOR, AND ROOF OPENINGS AND INSIDE CORNERS OF FLOORS.
9. PROVIDE WATERSTOPS IN ALL BELOW GRADE FOUNDATION WALL CONSTRUCTION JOINTS.
10. READY MIXED CONCRETE SHALL CONFORM TO ASTM C94.
11. PLACEMENT OF CONCRETE SHALL CONFORM TO ACI 304. CLEAN AND ROUGHEN TO 1/4" AMPLITUDE FOR ALL CONCRETE SURFACES AGAINST WHICH CONCRETE IS TO BE PLACED.
12. ALL EXPOSED CONCRETE WALL FACES SHALL HAVE A SMOOTH FORM FINISH USING B-B PLYFORM, CLASS I, EXT-APA PLYWOOD.
13. ALL SLABS SHALL HAVE A TROWEL FINISH EXCEPT AS NOTED ON THE DRAWINGS.
14. ALL REINFORCING STEEL, ANCHOR BOLTS, DOWELS AND INSERTS SHALL BE WELL SECURED IN POSITION PRIOR TO PLACING CONCRETE.
15. IF THE CONTRACTOR REQUESTS TO MAKE ANY CONSTRUCTION JOINTS OTHER THAN THOSE SHOWN ON THESE DRAWINGS, THEY SHALL SUBMIT DETAILS OF CHANGES TO THE DISTRICT'S REPRESENTATIVE OF RECORD FOR REVIEW BEFORE STARTING WORK.
16. NO BRICK OR POROUS MATERIAL SHALL BE USED TO SUPPORT FOUNDATION STEEL OFF THE GROUND.
17. PROVIDE 3/4 INCH CHAMFER ON ALL EXPOSED CONCRETE CORNERS, UON.
18. SLEEVE PIPING OPENINGS IN SLABS WITH NON-CORROSIVE SLEEVE BEFORE PLACING CONCRETE AND BEND REINFORCING AROUND SLEEVES.
19. ALL REINFORCING BARS FOR CAST-IN-PLACE CONCRETE CONSTRUCTION SHALL BE PROVIDED WITH THE FOLLOWING CONCRETE MINIMUM COVER:

FOOTINGS CAST AGAINST EARTH	3"
FORMED CONCRETE EXPOSED TO EARTH, WEATHER OR LIQUID	2"
BEAMS AND GIRDERS	2"
WALLS	2"
COLUMN TIES	2"
SLABS (#11 AND SMALLER)	2"

20. CONCRETE CURING: TYPICALLY REQUIRED A MINIMUM OF 10 DAYS.

STRUCTURAL STEEL :

1. FABRICATION AND ERECTION TO CONFORM TO AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC) LATEST EDITION "SPECIFICATION FOR THE DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL BUILDINGS" AND "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES" EXCEPT AS OTHERWISE SHOWN OR SPECIFIED.
2. AMERICAN WELDING SOCIETY (AWS) CERTIFIED WELDERS SHALL BE USED FOR ALL WELDING. WELDING TO BE PERFORMED IN AISC CERTIFIED FABRICATOR SHOP OR EQUAL. ALL WELDING TO CONFORM TO THE LATEST EDITION OF THE AMERICAN WELDING SOCIETY STRUCTURAL WELDING CODE AWS D1.1.
3. MATERIALS:

ROLLED SHAPES	
WIDE FLANGES	A992
ANGLES/CHANNELS	A36
PLATES	
BEAM/COVER SIDE PLATES	A572 Gr. 50
COLUMN CONTINUITY PLATES	A572 Gr. 50
COLUMN BASE PLATES	A572 Gr. 50
OTHER UON	A36
RECTANGULAR HSS	A500 Gr. B46
ROUND HSS	A500 Gr. B42
STEEL PIPE	A53 Gr. B
HIGH STRENGTH BOLTS	A325
MACHINE BOLTS	A307
ANCHOR BOLTS	F1554 Gr. 55 (UON)

4. ALL STRUCTURAL STEEL SHALL BE HOT-DIP GALVANIZED UON.
5. CONNECTED MEMBERS SHALL BEAR ONLY UPON UNTHREADED PORTIONS OF BOLTS.
6. BURNING OF HOLES IS NOT ALLOWED.
7. SPECIAL INSPECTION SHALL CONFORM TO CALIFORNIA BUILDING CODE (CBC) REQUIREMENTS (CHAPTER 17).
8. THE STRUCTURAL STEEL FABRICATOR SHALL SUBMIT SHOP DRAWINGS TO THE ENGINEER FOR REVIEW PRIOR TO FABRICATION.
9. BOLT HOLES SHALL BE 1/16" LARGER IN DIAMETER THAN NOMINAL SIZE OF BOLT USED, UNLESS NOTED OTHERWISE.
10. ALL STRUCTURAL STEEL SURFACES TO BE ENCASED IN CONCRETE OR MASONRY SHALL BE LEFT UNPAINTED.
11. STRUCTURAL STEEL SHALL BE DELIVERED TO THE JOB SITE FREE OF EXCESSIVE RUST, MILL SCALE, GREASE, ETC.
12. OPENING SHALL NOT BE PLACED IN STEEL MEMBERS UNLESS SPECIFICALLY DETAILED.
13. CONTRACTOR SHALL PROVIDE ISOLATION AT CONTACT BETWEEN ALL DISSIMILAR METALS.

WELDING :

1. ALL WELDING SHALL BE IN ACCORDANCE WITH THE PROVISIONS OF THE AMERICAN WELDING SOCIETY CODE D1.1. (LATEST EDITION).
2. ALL WELDING SHALL BE DONE BY CERTIFIED WELDERS.
3. ALL WELDS SHALL HAVE A WELD CONTROLLED SEQUENCE AND TECHNIQUE IN ORDER TO MINIMIZE SHRINKAGE, STRESSES AND DISTORTION.
4. ALL ELECTRODES FILLER MATERIAL SHALL BE A MINIMUM OF E70XX.
5. UNLESS A LARGER SIZE FILLET WELD IS INDICATED, PROVIDE MINIMUM SIZE WELD PER AISC SPECIFICATION, SECTION J2 AND TABLE J2.4.
6. WELD LENGTHS INDICATED ON PLANS ARE THE MINIMUM NET EFFECTIVE LENGTH REQUIRED. WHERE LENGTH OF WELD IS NOT SPECIFIED, IT SHALL BE FULL LENGTH OF JOINT.

KELLEY STRUCTURAL
DEAN ALDEN KELLEY NO. 6099
EXP. 6/30/2025
STRUCTURAL ENGINEER
STATE OF CALIFORNIA

DATE: 04/29/2024 | DESIGNED BY: MS | DRAWN BY: AM | CHECKED BY: DI

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER DEAN ALDEN KELLEY 6099 STRUCTURAL STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

PETALUMA 1858

SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
STRUCTURAL
GENERAL NOTES - 2

SHEET
S-2

23 OF 55

34"x22" ORIGINAL SCALE IN INCHES 0 1 2

Z:\Shared\cad\110 - dudek\38 - City of Petaluma ECWRF Chemical System Upgrade\Final\DETAILS\15219 S-2 4/29/2024 4:52 PM

REINFORCING STEEL :

1. ALL REINFORCING STEEL SHALL BE PLACED IN CONFORMANCE WITH THE IBC, AND THE "MANUAL OF STANDARD PRACTICE" BY THE CRSI OR AS MODIFIED BY THE CONSTRUCTION DOCUMENTS.
2. REINFORCING STEEL SHALL CONFORM TO THE FOLLOWING STANDARDS:

DEFORMED BARS	ASTM A615 GR 60
WELDED REINFORCEMENT	ASTM A706

3. STEEL REINFORCEMENT SHALL BE SECURELY TIED IN PLACE SO AS TO MAINTAIN THEIR EXACT POSITION BEFORE AND DURING PLACEMENT OF THE CONCRETE. BARS IN BEAMS AND SLABS SHALL BE SUPPORTED ON WELL-CURED CONCRETE BLOCKS OR APPROVED PLASTIC TIPPED METAL CHAIRS, AS SPECIFIED BY CRSI MANUAL OF STANDARD PRACTICE, MSP-1. WIRE FABRIC IN SLABS SHALL BE SECURELY FASTENED TO SUPPORTING DEVICES TO MAINTAIN THEIR POSITION DURING CONCRETE PLACEMENT.
4. NO WELDING OF REINF. ALLOWED UNLESS APPROVED BY ENGINEER WHERE WELDING OF REINFORCING BARS ARE APPROVED BY THE ENGINEER, BARS SHALL BE A706 AND WELDING SHALL BE DONE BY AWS CERTIFIED WELDERS USING THE SMAW PROCESS AND E80XX ELECTRODES. WELDING PROCEDURE SHALL BE QUALIFIED PER THE REQUIREMENTS OF THE "STRUCTURAL WELDING CODE – REINFORCING STEEL", AWS D1.4, LATEST EDITION.
5. DETAILS OF REINFORCEMENT SHALL COMPLY WITH ACI 318, CHAPTER 25 (LATEST EDITION).
6. ALL REINFORCING BAR BENDS SHALL BE MADE COLD, UNLESS OTHERWISE PERMITTED BY THE DISTRICT.
7. DOWELS BETWEEN FOOTINGS AND WALLS OR COLUMNS SHALL BE LAPPED WITH THE SAME GRADE, SIZE, SPACING AND NUMBER AS THE VERTICAL REINFORCEMENT.
8. REINFORCING SPLICES SHALL BE MADE AS INDICATED ON THE DRAWINGS.
9. SLAB ON GRADE REINFORCING SHALL BE POSITIONED AT MID-DEPTH, UNLESS OTHERWISE NOTED.
10. PIPING AND CONDUIT SHALL BE SO FABRICATED AND INSTALLED THAT CUTTING, BENDING, OR DISPLACEMENT OF REINFORCEMENT FROM ITS PROPER LOCATION WILL NOT BE REQUIRED.
11. MINIMUM CLEAR DISTANCES BETWEEN REINFORCING STEEL, INCLUDING SPLICED REINFORCEMENT, SHALL BE 1" OR 1 BAR DIAMETER, WHICHEVER IS GREATER. MINIMUM CLEAR DISTANCE AT COLUMNS SHALL BE 1 1/2" OR 1 1/2" BAR DIAMETERS, WHICHEVER IS GREATER.
12. ALL REINFORCEMENT SHALL BE CENTERED ON MEMBER UNLESS OTHERWISE INDICATED.

ADHESIVE ANCHORS AND DOWELS :

1. ADHESIVE ANCHORS AND DOWELS INSTALLED INTO CONCRETE SHALL BE AS INDICATED BELOW, UNLESS OTHERWISE NOTED. INSTALLATION SHALL BE IN ACCORDANCE WITH THE INTERNATIONAL CODE COUNCIL (ICC) REPORT AND MANUFACTURER'S RECOMMENDATIONS.

CONCRETE:	HILTI HIT HY 200 V3	(ICC ESR-4868)
	SIMPSON SET-XP	(ICC ESR-2508)
	OR APPROVED EQUAL	

2. ANCHOR ROD SHALL BE ASTM F593 TYPE 316 STAINLESS, UON. NUTS AND WASHERS SHALL COMPLY WITH ASTM A193.
3. ANCHOR BOLTS SHALL BE ASTM F593 TYPE 316 STAINLESS, UON. NUTS AND WASHERS SHALL COMPLY WITH ASTM A193.
4. ANCHORS INSTALLERS SHALL BE TRAINED BY A QUALIFIED REPRESENTATIVE OF THE ADHESIVE MANUFACTURER ON THE PROPER PROCEDURES AND TECHNIQUES FOR INSTALLATION.
5. PROVIDE ANCHORS WITH THE TYPE, DIAMETER, AND MINIMUM EMBEDMENT DEPTH AS NOTED ON THE DRAWINGS. SUBSTITUTIONS ARE NOT ALLOWED WITHOUT APPROVAL FROM THE STRUCTURAL ENGINEER.
6. THE DIAMETER AND DRILLING METHOD OF THE HOLES ARE PER THE MANUFACTURER'S RECOMMENDATIONS. PRIOR TO INSTALLING ANCHORS OR DOWELS, WIRE BRUSH HOLES TO REMOVE RESIDUE, BLOW OUT WITH OIL-FREE COMPRESSED AIR, AND ALLOW HOLE TO DRY.LOCATE REINFORCEMENT AND CONFIRM FINAL ANCHOR LOCATIONS PRIOR TO FABRICATING PLATES, MEMBERS, OR OTHER STEEL ASSEMBLIES ATTACHED WITH ADHESIVE ANCHORS.
7. REMOVE GREASE, OIL, RUST, AND OTHER LAITANCE FROM RODS AND DOWELS PRIOR TO INSTALLATION.
8. WHEN INSTALLING ANCHORS IN EXISTING REINFORCED CONCRETE OR MASONRY, AVOID CUTTING OR DAMAGING THE EXISTING REINFORCING BARS.
9. HOLES DRILLED FOR ANCHORS THAT DO NOT SET PROPERLY OR IF REINFORCEMENT IS ENCOUNTERED DURING DRILLING, ABANDON AND SHIFT THE HOLE LOCATION TO AVOID THE REINFORCEMENT. PROVIDE A MINIMUM OF 2 ANCHOR DIAMETERS OR 1 INCH, WHICHEVER IS LARGER. FILL THE ABANDONED HOLE WITH NON-SHRINK GROUT.

STATEMENTS OF SPECIAL INSPECTIONS :

(APPLIES TO ALL TABLES):

1. THIS STATEMENT OF SPECIAL INSPECTIONS IS SUBMITTED IN FULFILLMENT OF THE REQUIREMENT OF CBC SECTIONS 1704 AND 1705.
2. SPECIAL INSPECTIONS SHALL BE PERFORMED FOR THE FOLLOWING WORK IN FULFILLMENT OF THE REQUIREMENTS OF THE CBC:

   A. CONCRETE
   B. SOILS
   C. STEEL
   D. DEEP FOUNDATIONS

3. NOTICE TO THE APPLICANT / CITY / CITY'S AGENT / ENGINEER OF RECORD: BY USING THIS PERMITTED CONSTRUCTION DRAWINGS FOR CONSTRUCTION/INSTALLATION OF THE WORK SPECIFIED HEREIN, YOU AGREE TO COMPLY WITH THE REQUIREMENTS OF THE CITY FOR SPECIAL INSPECTIONS, STRUCTURAL OBSERVATIONS, CONSTRUCTION MATERIAL TESTING AND OFF-SITE FABRICATION OF BUILDING COMPONENTS, CONTAINED IN THE STATEMENT OF SPECIAL INSPECTIONS AND, AS REQUIRED BY THE CALIFORNIA CONSTRUCTION CODES.
4. NOTICE TO THE CONTRACTOR / BUILDER / INSTALLER / SUB-CONTRACTOR / CITY-BUILDER: BY USING THIS PERMITTED CONSTRUCTION DRAWINGS FOR CONSTRUCTION/INSTALLATION OF THE WORK SPECIFIED HEREIN, YOU ACKNOWLEDGE AND ARE AWARE OF, THE REQUIREMENTS CONTAINED IN THE STATEMENT OF SPECIAL INSPECTIONS. YOU AGREE TO COMPLY WITH THE REQUIREMENTS OF THE DISTRICT FOR SPECIAL INSPECTIONS, STRUCTURAL OBSERVATIONS, CONSTRUCTION MATERIAL TESTING AND OFF-SITE FABRICATION OF BUILDING COMPONENTS, CONTAINED IN THE STATEMENT OF SPECIAL INSPECTIONS AND, AS REQUIRED BY THE CALIFORNIA CONSTRUCTION CODES.
5. THE SPECIAL INSPECTIONS IDENTIFIED ON PLANS ARE, IN ADDITION TO, AND NOT SUBSTITUTE FOR, THOSE INSPECTIONS REQUIRED TO BE PERFORMED BY THE CITY'S INSPECTOR.
6. A SPECIAL INSPECTOR OR INSPECTION AGENCY QUALIFIED IN THE CATEGORY OF WORK REQUIRING SPECIAL INSPECTION SHALL BE FURNISHED BY THE CONTRACTOR AT NO COST TO THE CITY. THE CITY AND/OR ENGINEER OF RECORD SHALL PROVIDE APPROVAL OF THE SPECIAL INSPECTOR OR INSPECTION AGENCY PRIOR TO THE COMMENCEMENT OF WORK.
7. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY THE SPECIAL INSPECTOR OR INSPECTION AGENCY AT LEAST ONE WORKING DAY PRIOR TO PERFORMING ANY WORK THAT REQUIRES SPECIAL INSPECTION.
8. SPECIALLY INSPECTED WORK THAT IS INSTALLED OR COVERED WITHOUT THE APPROVAL OF THE SPECIAL INSPECTOR IS SUBJECT TO REMOVAL OR EXPOSURE.
9. THE CONSTRUCTION MATERIALS TESTING LABORATORY MUST BE APPROVED BY THE CITY FOR TESTING OF MATERIALS, SYSTEMS, COMPONENTS AND EQUIPMENT.
10. FABRICATOR MUST BE APPROVED BY THE CITY FOR THE FABRICATION OF MEMBERS AND ASSEMBLIES ON THE PREMISES OF THE FABRICATOR'S SHOP.
11. FABRICATOR SHALL SUBMIT AN 'APPLICATION TO PERFORM OFF-SITE FABRICATION' TO THE INSPECTION SERVICES DIVISION FOR APPROVAL PRIOR TO THE COMMENCEMENT OF FABRICATION.
12. FABRICATOR SHALL SUBMIT A 'CERTIFICATE OF COMPLIANCE FOR OFF-SITE FABRICATION' TO THE INSPECTION SERVICES DIVISION PRIOR TO ERECTION OF FABRICATED ITEMS AND ASSEMBLIES.
13. SITE VISITS OR STRUCTURAL OBSERVATIONS BY THE ENGINEER OF RECORD DO NOT CONSTITUTE SPECIAL INSPECTIONS.

REQUIRED REPORTS:

1. THE SPECIAL INSPECTOR SHALL FURNISH INSPECTION REPORTS TO THE CITY AND TO THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE.
2. SPECIAL INSPECTION REPORTS SHALL INDICATE THAT THE WORK INSPECTED WAS PERFORMED IN CONFORMANCE WITH THE APPROVED CONSTRUCTION DOCUMENTS.
3. DISCREPANCIES SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE CONTRACTOR FOR CORRECTION.
4. IF DISCREPANCIES ARE NOT CORRECTED, THE DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE CITY AND TO THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE PRIOR TO COMPLETION OF THAT PHASE OF WORK.
5. A FINAL REPORT DOCUMENTING THE REQUIRED SPECIAL INSPECTIONS AND CORRECTION OF ANY DISCREPANCIES NOTED IN THE INSPECTIONS SHALL BE SUBMITTED AT A POINT IN TIME AGREED UPON BY THE PERMIT APPLICANT AND THE CITY PRIOR TO THE START OF WORK.

CONTINUOUS AND PERIODIC INSPECTIONS:

1. WHERE CONTINUOUS SPECIAL INSPECTION IS INDICATED, THE SPECIAL INSPECTOR SHALL CONTINUOUSLY PROVIDE FULL-TIME VERIFICATION OF THE WORK.
2. WHERE PERIODIC SPECIAL INSPECTION IS INDICATED, THE SPECIAL INSPECTOR SHALL PROVIDE VERIFICATION THAT THE PERIODIC INSPECTION WAS PERFORMED.

TABLE 1705.3 (CBC LATEST EDITION)

REQUIRED SPECIAL INSPECTIONS AND TESTS OF CONCRETE CONSTRUCTION

VERIFICATION AND INSPECTION	CONTINUOUS INSPECTION	PERIODIC INSPECTION
1. REINFORCING STEEL AND PLACEMENT.	–	X
2. REINFORCING BAR WELDING		
a. VERIFY WELDABILITY OF BARS OTHER THAN ASTM A706	–	X
b. SINGLE PASS FILLET WELDS, MAXIMUM 5/16 INCH	–	X
c. OTHER WELDS	X	–
3. CAST-IN PLACE BOLTS AND EMBEDS	–	X
4. POST-INSTALLED ANCHORS OR DOWELS INSTALLED IN HARDENED CONCRETE MEMBERS		
a. ADHESIVE ANCHORS INSTALLED IN HORIZONTALLY OR UPWARDLY INCLINED ORIENTATIONS TO RESIST SUSTAINED TENSION LOADS	X	–
b. MECHANICAL ANCHORS AND ADHESIVE ANCHORS NOT DEFINED IN 4.a	–	X
5. USE OF REQUIRED DESIGN MIX.	–	X
6. CONCRETE SAMPLING FOR STRENGTH TESTS, PERFORM SLUMP AND AIR CONTENT TESTS, AND TEMPERATURE OF THE CONCRETE PRIOR TO PLACEMENT.	X	–
7. CONCRETE PLACEMENT FOR PROPER APPLICATION TECHNIQUES.	X	–
8. CURING TEMPERATURE AND TECHNIQUES.	–	X
9. VERIFY IN-SITU CONCRETE STRENGTH, PRIOR TO REMOVAL OF SHORES AND FORMS FROM BEAMS AND STRUCTURAL SLABS.	–	X
10. INSPECT FORMWORK FOR SHAPE, LOCATION AND DIMENSIONS OF THE CONC. MEMBER BEING FORMED.	–	X
11. REINFORCEMENT COMPLYING WITH ASTM A615	–	X

TABLE 1705.8 (CBC LATEST EDITION)

REQUIRED SPECIAL INSPECTIONS AND TESTS OF CAST-IN-PLACE DEEP FOUNDATION ELEMENTS

VERIFICATION AND INSPECTION	CONTINUOUS INSPECTION	PERIODIC INSPECTION
1. INSPECT DRILLING OPERATIONS AND MAINTAIN COMPLETE AND ACCURATE RECORDS FOR EACH ELEMENT.	X	–
2. VERIFY PLACEMENT LOCATIONS AND PLUMBNESS, CONFIRM ELEMENT DIAMETERS, BELL DIAMETERS (IF APPLICABLE), LENGTHS, EMBEDMENT INTO BEDROCK (IF APPLICABLE) AND ADEQUATE END-BEARING STRATA CAPACITY. RECORD CONCRETE OR GROUT VOLUMES.	X	–
3. FOR CONCRETE ELEMENTS, PERFORM TESTS AND ADDITIONAL SPECIAL INSPECTIONS IN ACCORDANCE WITH SECTION 1705.3.	–	–

TABLE 1705.6 (CBC LATEST EDITION)

REQUIRED SPECIAL INSPECTIONS AND TESTS OF SOILS

VERIFICATION AND INSPECTION	CONTINUOUS INSPECTION	PERIODIC INSPECTION
1. VERIFY MATERIALS BELOW SHALLOW FOUNDATIONS ARE ADEQUATE TO ACHIEVE THE DESIGN BEARING CAPACITY.	–	X
2. VERIFY EXCAVATIONS ARE EXTENDED TO PROPER DEPTH AND HAVE REACHED PROPER MATERIAL.	–	X
3. PERFORM CLASSIFICATION AND TESTING OF COMPACTED FILL MATERIALS.	–	X
4. VERIFY USE OF PROPER MATERIALS, DENSITIES AND LIFT THICKNESSES DURING PLACEMENT AND COMPACTION OF COMPACTED FILL.	X	–
5. PRIOR TO PLACEMENT OF COMPACTED FILL, OBSERVE SUBGRADE AND VERIFY THAT SITE HAS BEEN PREPARED PROPERLY.	–	X

KELEY STRUCTURAL
DEAN ALDEN KEL No. 7726
EXP. 6-30-2025
STRUCTURAL ENGINEER

DATE: 04/29/2024 | DESIGNED BY: MS | DRAWN BY: AM | CHECKED BY: DI

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER – DEAN ALDEN KELEY – 6099 – STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
STRUCTURAL
GENERAL NOTES - 3

SHEET
S-3

24 OF 55

34"x22" ORIGINAL SCALE IN INCHES 0 1 2

Z:\Shared\cad\110 - dudek\38 - City of Petaluma EC\WRF Chemical System Upgrade\Final\DETAILS\15219 S-3 4/29/2024 4:52 PM

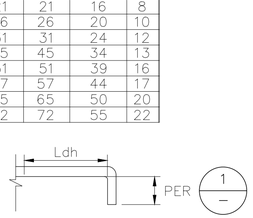
TYPICAL REINFORCING LAP SPLICE AND EMBEDMENT LENGTH SCHEDULE

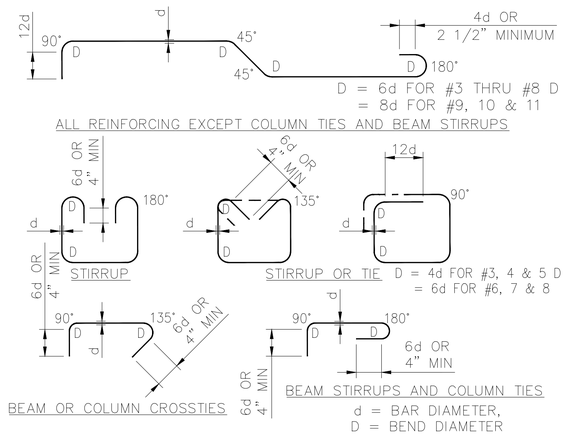
REBAR SPLICE AND DEVELOPMENT SCHEDULES

SCHEDULE "A"

BAR#	CONC f'c = 3,000 PSI					BAR#	CONC f'c = 4,000 PSI					BAR#	CONC f'c = 5,000 PSI					BAR#	CONC f'c = 6,000 PSI				
	SPLICE		DEVELOPMENT		L_{dh}		SPLICE		DEVELOPMENT		L_{dh}		SPLICE		DEVELOPMENT		L_{dh}		SPLICE		DEVELOPMENT		L_{dh}
	TOP	OTHER	TOP	OTHER			TOP	OTHER	TOP	OTHER			TOP	OTHER	TOP	OTHER			TOP	OTHER	TOP	OTHER	
#3	29	22	22	17	8	#3	25	20	20	15	7	#3	22	17	17	13	7	#3	21	16	16	12	6
#4	38	29	29	22	11	#4	33	25	25	19	10	#4	30	23	23	17	9	#4	27	21	21	16	8
#5	47	36	36	28	14	#5	40	31	31	24	12	#5	36	29	29	22	11	#5	34	26	26	20	10
#6	56	43	43	33	17	#6	48	38	38	29	15	#6	44	34	34	26	13	#6	40	31	31	24	12
#7	82	63	63	48	19	#7	70	55	55	42	17	#7	64	49	49	38	15	#7	59	45	45	34	13
#8	94	72	72	55	22	#8	81	62	62	48	19	#8	73	56	56	43	17	#8	66	51	51	39	16
#9	105	81	81	62	25	#9	91	70	70	54	22	#9	82	63	63	48	19	#9	74	57	57	44	17
#10	118	91	91	70	28	#10	103	79	79	61	24	#10	92	71	71	54	21	#10	83	65	65	50	20
#11	131	101	101	78	50	#11	113	87	87	67	29	#11	101	78	78	60	24	#11	92	72	72	55	22

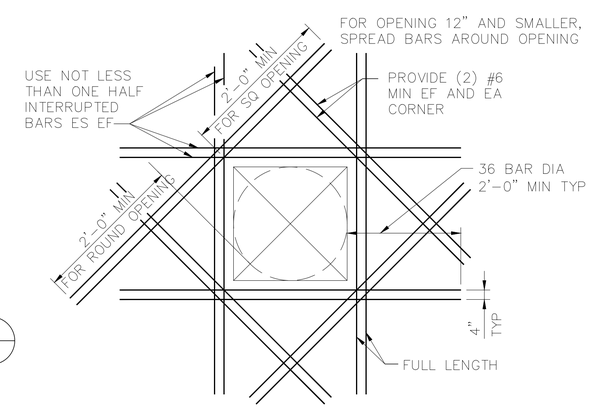
NOTES:
1. SPLICE AND EMBEDMENT LENGTHS ARE IN INCHES. SPLICE SHALL BE CLASS "B" UON.
2. 0.80 SPLICE LENGTH MAY BE USED IF NOT MORE THAN 1/2" OF THE BARS ARE LAP SPLICED WITHIN A REQUIRED LAP LENGTH.
3. TOP BARS ARE HORIZONTAL BARS WITH MORE THAN 12" CONC BELOW, OTHER BARS ARE BOTTOM OR VERTICAL BARS.
4. WHERE REQUIRED EMBEDMENT CANNOT BE OBTAINED WITH STRAIGHT BARS, PROVIDE 180° OR 90° HOOK EQUAL TO LENGTH BELOW.
5. SCHEDULE IS FOR GRADE 60 BARS.
6. SCHEDULE IS FOR NORMAL WEIGHT CONCRETE. INCREASE SCHEDULE VALUE BY 1.33 FOR LIGHTWEIGHT CONCRETE.
7. CLEAR SPACING BETWEEN BARS BEING DEVELOPED SHALL BE GREATER THAN 2db AND CONC COVER GREATER THAN db.
8. SPLICE LENGTH FOR BARS OF DIFFERENT SIZE SHALL BE LARGER OF DEVELOPMENT LENGTH OF LARGER BAR AND SPLICE LENGTH OF SMALLER BAR.



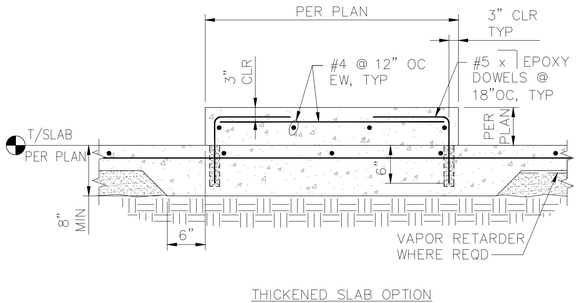


STD HOOKS & BENDS
NTS — 1 / –

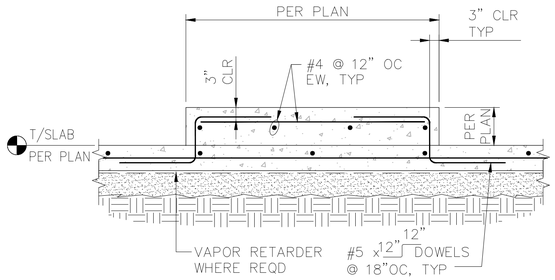
TYPICAL REINF LAP SPLICE AND EMBED LENGTH
NTS — 2 / –



TYPICAL REINF AT LARGE OPNG
NTS — 3 / –

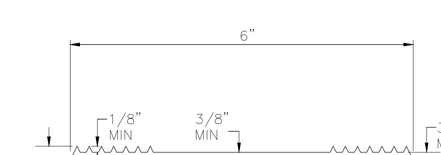


THICKENED SLAB OPTION



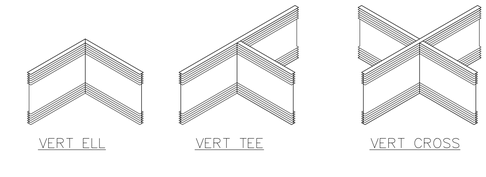
CONTINUOUS SLAB OPTION

CONCRETE PAD ON SLAB ON GRADE
NTS — 4 / –

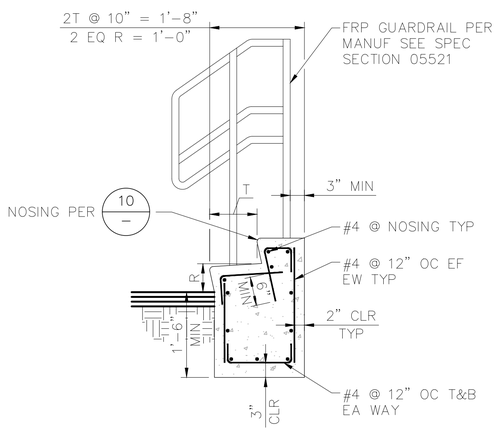


6" FLATSTRIP WATERSTOP

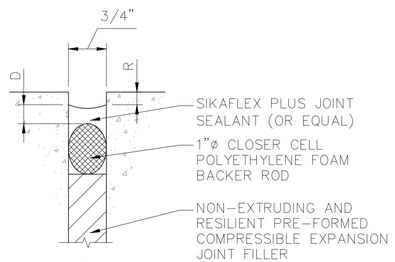
WATERSTOP DETAIL
NTS — 5 / –



FLATSTRIP WATERSTOPS PREFABRICATED JOINTS
NTS — 6 / –



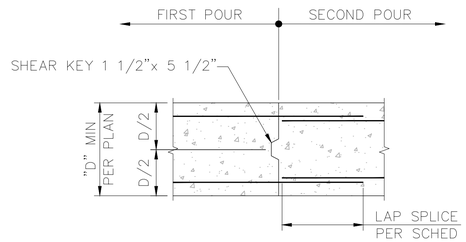
TYPICAL CONC STAIR
NTS — 7 / –



DEFINITIONS

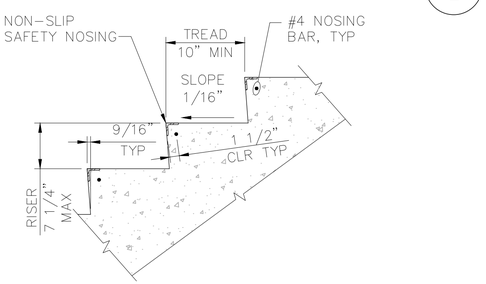
D = 3/8" (OR PER MANUF RECOMMENDATION)
R = 1/4"± 1/16"

SLAB EXPANSION JOINT
NTS — 8 / –



NOTE:
1. CONTRACTOR OPTION TO USE MECHANICAL BAR SPLICE IN LIEU OF LAP SPLICE. MECHANICAL SPLICE SHALL DEVELOP 125% OF THE SPECIFIED REBAR YIELD STRENGTH AND SHALL HAVE APPROVED ICC REPORT.

TYPICAL FTG CONST JOINT
NTS — 9 / –



NOTE:
1. WHERE STAIRWAYS OCCUR OUTSIDE A BUILDING, THE UPPER APPROACH AND ALL TREADS SHALL BE MARKED BY A STRIP OF CLEARLY CONTRASTING COLOR AT LEAST 2" AND NOT MORE THAN 4" WIDE AND PLACED PARALLEL TO AND NOT MORE THAN 1" FROM THE NOSE OF THE STEP OR LANDING.

TYPICAL STAIR NOSING
NTS — 10 / –

KELLEY STRUCTURAL ENGINEERING, INC. — 1004 ALDEN AVE. No. 1708, PETALUMA, CA 94954, 415.930.1382

DATE: 04/29/2024 | DESIGNED BY: MS | DRAWN BY: AM | CHECKED BY: DI

PROJECT NO. C66501840

REGISTERED PROFESSIONAL ENGINEER — MATTHEW S. KELLEY — No. 6099 — STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

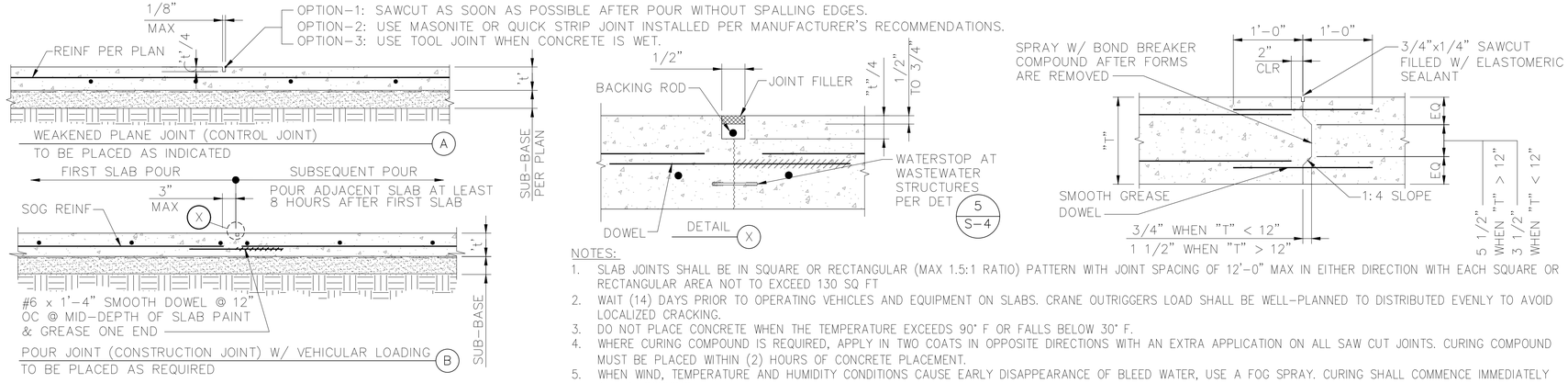
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
STRUCTURAL
TYPICAL DETAILS - 1

SHEET S-4

25 OF 55

Z:\Shared\cad\110 - dudak\38 - City of Petaluma ECWRF Chemical System Upgrade\Final\DETAILS\15219 S-4 4/29/2024 4:52 PM

3.4"x22" ORIGINAL SCALE IN INCHES 0 1 2



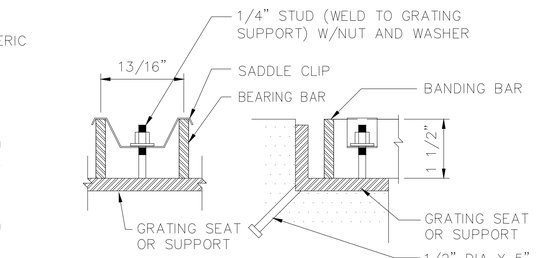
NOTES:

1. SLAB JOINTS SHALL BE IN SQUARE OR RECTANGULAR (MAX 1.5:1 RATIO) PATTERN WITH JOINT SPACING OF 12'-0" MAX IN EITHER DIRECTION WITH EACH SQUARE OR RECTANGULAR AREA NOT TO EXCEED 130 SQ FT
2. WAIT (14) DAYS PRIOR TO OPERATING VEHICLES AND EQUIPMENT ON SLABS. CRANE OUTRIGGERS LOAD SHALL BE WELL-PLANNED TO DISTRIBUTED EVENLY TO AVOID LOCALIZED CRACKING.
3. DO NOT PLACE CONCRETE WHEN THE TEMPERATURE EXCEEDS 90° F OR FALLS BELOW 30° F.
4. WHERE CURING COMPOUND IS REQUIRED, APPLY IN TWO COATS IN OPPOSITE DIRECTIONS WITH AN EXTRA APPLICATION ON ALL SAW CUT JOINTS. CURING COMPOUND MUST BE PLACED WITHIN (2) HOURS OF CONCRETE PLACEMENT.
5. WHEN WIND, TEMPERATURE AND HUMIDITY CONDITIONS CAUSE EARLY DISAPPEARANCE OF BLEED WATER, USE A FOG SPRAY. CURING SHALL COMMENCE IMMEDIATELY AFTER FINISHING.

TYPICAL SLAB ON GRADE JOINTS

NTS

1 / –



NOTES:

1. PROVIDE A MINIMUM OF 4 CLIPS PER GRATING PANEL APPROX 4" FROM PANEL CORNERS. MAXIMUM CLIP SPACING AT 36" OC.
2. STUD, NUT, WASHER AND CLIP TO BE OF SAME MATERIAL AS GRATING SEAT OR SUPPORT.

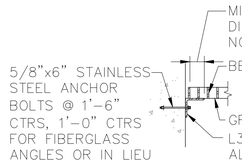
GRATING ANCHOR

NTS

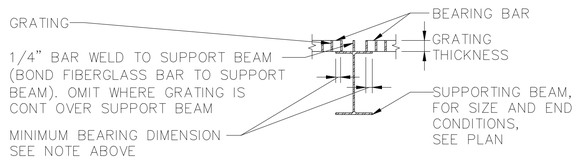
2 / –

GRATING NOTES :

1. EXTEND GRATING CONTINUOUSLY OVER GATE GUIDES AND GATES.
2. NOTCH GRATING SUPPORTS AT GATES AS REQUIRED.
3. GRATING SPAN ⟷ SEE PLAN.
4. WIDTH OF GRATING SECTIONS SHALL NOT EXCEED 3'-0".
5. SHOP DRAWINGS BASED ON FIELD DIMENSIONS SHALL BE SUBMITTED TO THE CONSTRUCTION MANAGER PRIOR TO FABRICATION.
6. MATERIAL FOR SUPPORTS OF STEEL AND ALUMINUM GRATING TO BE SAME AS GRATING. EXCEPT METAL SUPPORTS THAT ARE TO BE EMBEDDED IN CONCRETE SHALL BE TYPE 316 STAINLESS STEEL.
7. UNLESS NOTED OTHERWISE ON PLANS, GRATING THICKNESS SHALL BE AS 'TABULATED IN GRATING THICKNESS TABLE' FOR APPLICABLE TRAFFIC.
8. BEARING BAR THICKNESS FOR GRATING TO BE 3/16" MINIMUM.
9. BAND ALL EDGES WITH 3/16 x DEPTH OF BEARING BAR.
10. PROVIDE MISCELLANEOUS GRATING FASTENERS AS REQUIRED.
11. TYPE OF MATERIAL USED SHALL BE AS SHOWN ON PLANS OR AS SPECIFIED. THIS STANDARD DETAIL INCLUDES 3 TYPES. ALTHOUGH ALL 3 MAY NOT BE INCLUDED IN PROJECT.
12. THE HORIZONTAL CLEARANCE BETWEEN THE GRATING AND GRATING SUPPORTS SHALL NOT BE LESS THAN 1/4" NOR GREATER THAN 1/2" AND AS SPECIFIED.
13. ALL GRATING SECTIONS WHEN IN PLACE SHALL ALWAYS BE FIRMLY ANCHORED TO THEIR SUPPORTS AS SPECIFIED AND AS IN DET 2 –



FOOT TRAFFIC GRATING THICKNESS TABLE			
MAXIMUM SPAN	ALUMINUM (IN)	STEEL (IN)	FIBERGLASS (IN)
3'-6"	1 1/4 "	1"	1 1/2 "
4'-0"	1 1/2 "	1"	1 1/2 "
4'-6"	1 3/4 "	1"	1 1/2 "
5'-0"	1 3/4 "	1 1/4 "	MAXIMUM ALLOWABLE SPAN IS 4'-6" LIMIT DEFLECTION TO 1/4 " MAX
5'-6"	2"	1 1/4 "	
6'-0"	2 1/4 "	1 1/2 "	
6'-6"	2 1/4 "	1 1/2 "	
7'-0"	2 1/2 "	1 3/4 "	



COMPONENT WEIGHT	REQUIRED ANCHOR			
	ANCHOR TYPE & EFFECTIVE EMBED	MIN ANCHOR QTY PER SIDE	MIN EFFECTIVE EMBED (in)	MIN EDGE DISTANCE (in)
0–1,500 lbs	5/8" HILTI 'HIT-HY 200-R V3'	2	4	6
1,500–5,000 lbs	5/8" HILTI 'HIT-HY 200-R V3'	3	6	6
5,000–10,000 lbs	5/8" HILTI 'HIT-HY 200-R V3'	4	6	8
10,000–20,000 lbs	3/4" HILTI 'HIT-HY 200-R V3'	6	8	12
20,000–30,000 lbs	3/4" HILTI 'HIT-HY 200-R V3'	8	8	12

NOTE:

1. FOR COMPONENTS WHERE LENGTH IS GREATER THAN TWICE THE WIDTH, PROVIDE MIN ANCHORS ON LONG SIDE OF COMPONENT.

GRATING SUPPORT DETAIL

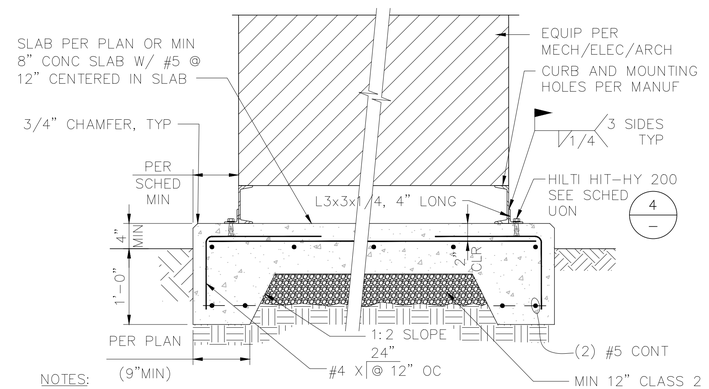
NTS

3 / –

TYPICAL MECH ANCHORAGE SCHEDULE

NTS

4 / –



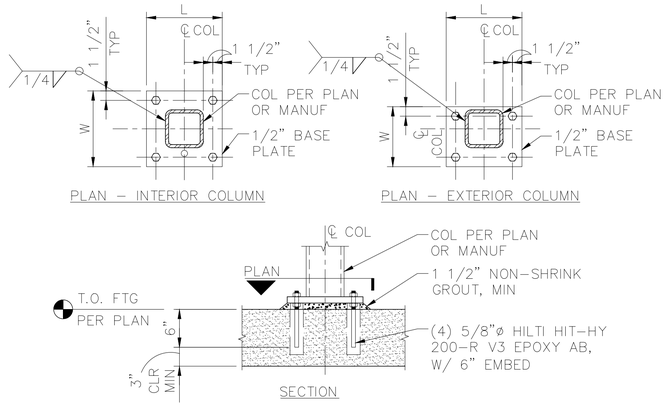
NOTES:

1. VERIFY PAD SIZE AND LOCATION W/ MECH/ELEC/ARCH DWGS.
2. CONFIRM ALL DIMENSIONS OF EQUIPMENT PER MANUFACTURER PRIOR TO CONCRETE POUR.

TYPICAL EQUIPMENT PAD DETAIL

NTS

5 / –



COLUMN BASEPLATE

NTS

6 / –

KELEY STRUCTURAL
DEAN ALDEN, MS, No. 7726
1 KELEY STREET
619.930.1393
dean@keleystructural.com

DATE: 04/29/2024
DESIGNED BY: MS
DRAWN BY: AM
CHECKED BY: DI

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER DEAN ALDEN KELEY 6099 STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

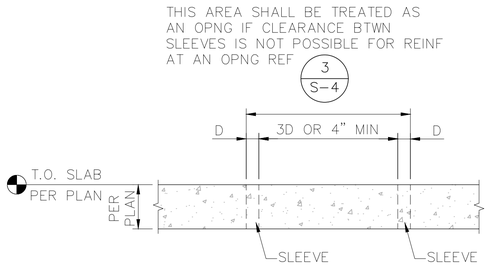
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
STRUCTURAL
TYPICAL DETAILS - 2

SHEET
S-5

26 OF 55

34"x22" ORIGINAL SCALE IN INCHES 0 1 2

Z:\Shared\cad\110 - dudek\38 - City of Petaluma ECWRF Chemical System Upgrade\Final\DETAILS\15219 S-5 4/29/2024 4:52 PM

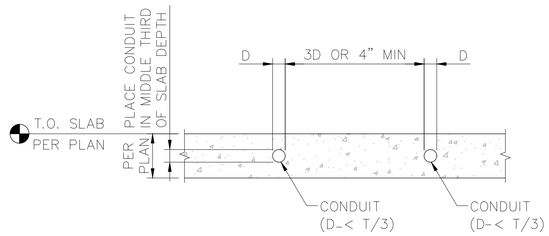


NOTES:
1. ALUMINUM MATERIALS SHALL NOT BE EMBEDDED IN CONCRETE.
2. SLEEVES WITHIN 48" OF A COLUMN ARE NOT PERMITTED WITHOUT ENGINEER'S APPROVAL.

SLEEVES THRU CONCRETE SLAB

NTS

1

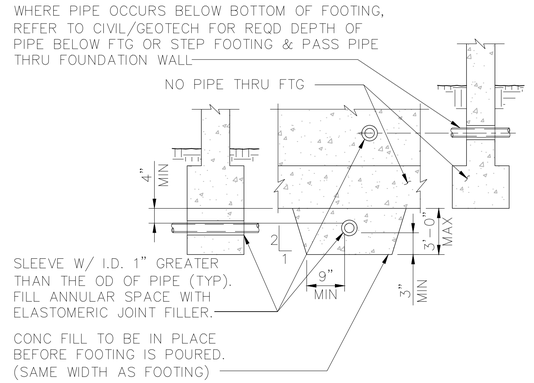


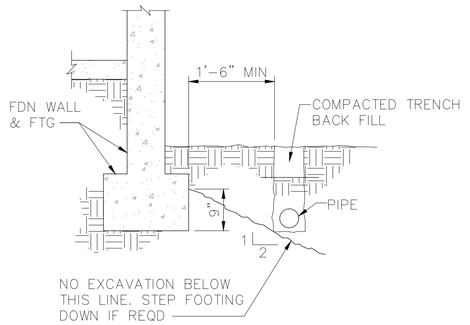
NOTES:
1. ALUMINUM MATERIALS SHALL NOT BE EMBEDDED IN CONCRETE.
2. PROVIDE 2" MINIMUM CLEARANCE BETWEEN CONDUIT AND REINF/TENDONS.

CONDUIT THRU CONCRETE SLAB

NTS

2

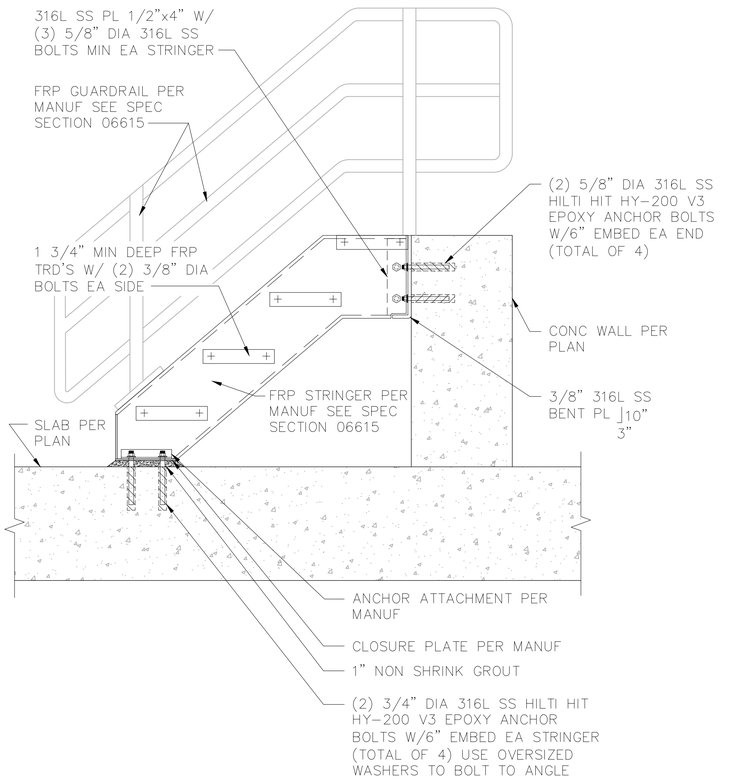




TYPICAL PIPE ADJACENT TO FOOTING

NTS

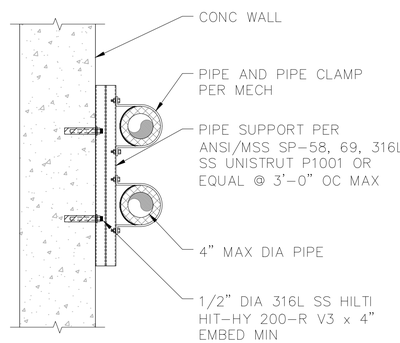
3



STAIR AND PLATFORM FRAMING

NTS

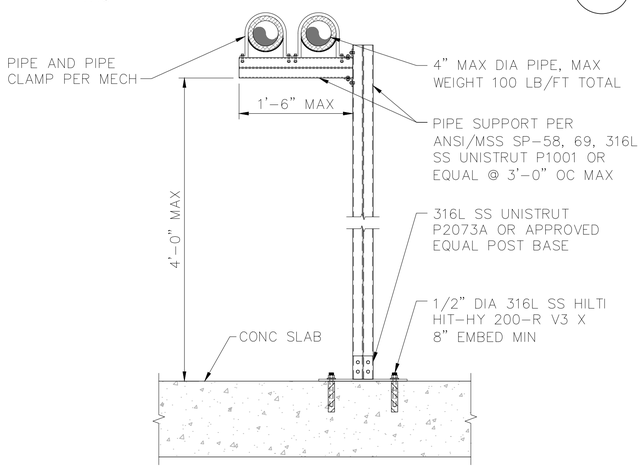
4



WALL-MOUNTED PIPE SUPPORT

NTS

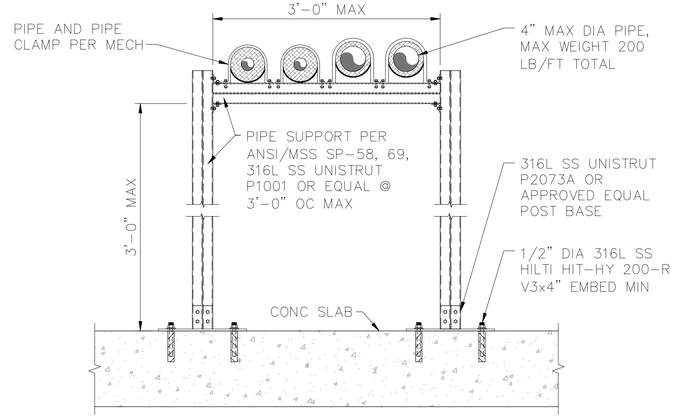
5



CANTILEVER PIPE SUPPORT

NTS

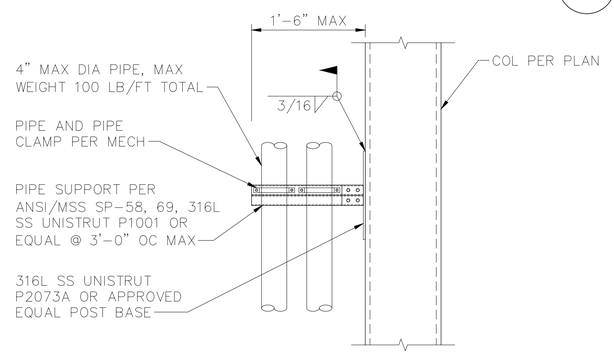
7



FLOOR-MOUNTED PIPE SUPPORT

NTS

6



COLUMN-MOUNTED PIPE SUPPORT

NTS

8

KELEY STRUCTURAL
DEAN ALDEN KEL No. 7726
EXP. 6/30/25 CA STATE
619.930.1393
dean@keleystructural.com

DATE: 04/29/2024
DESIGNED BY: MS
DRAWN BY: AM
CHECKED BY: DI

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER DEAN ALDEN KELEY 6099 CIVIL STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

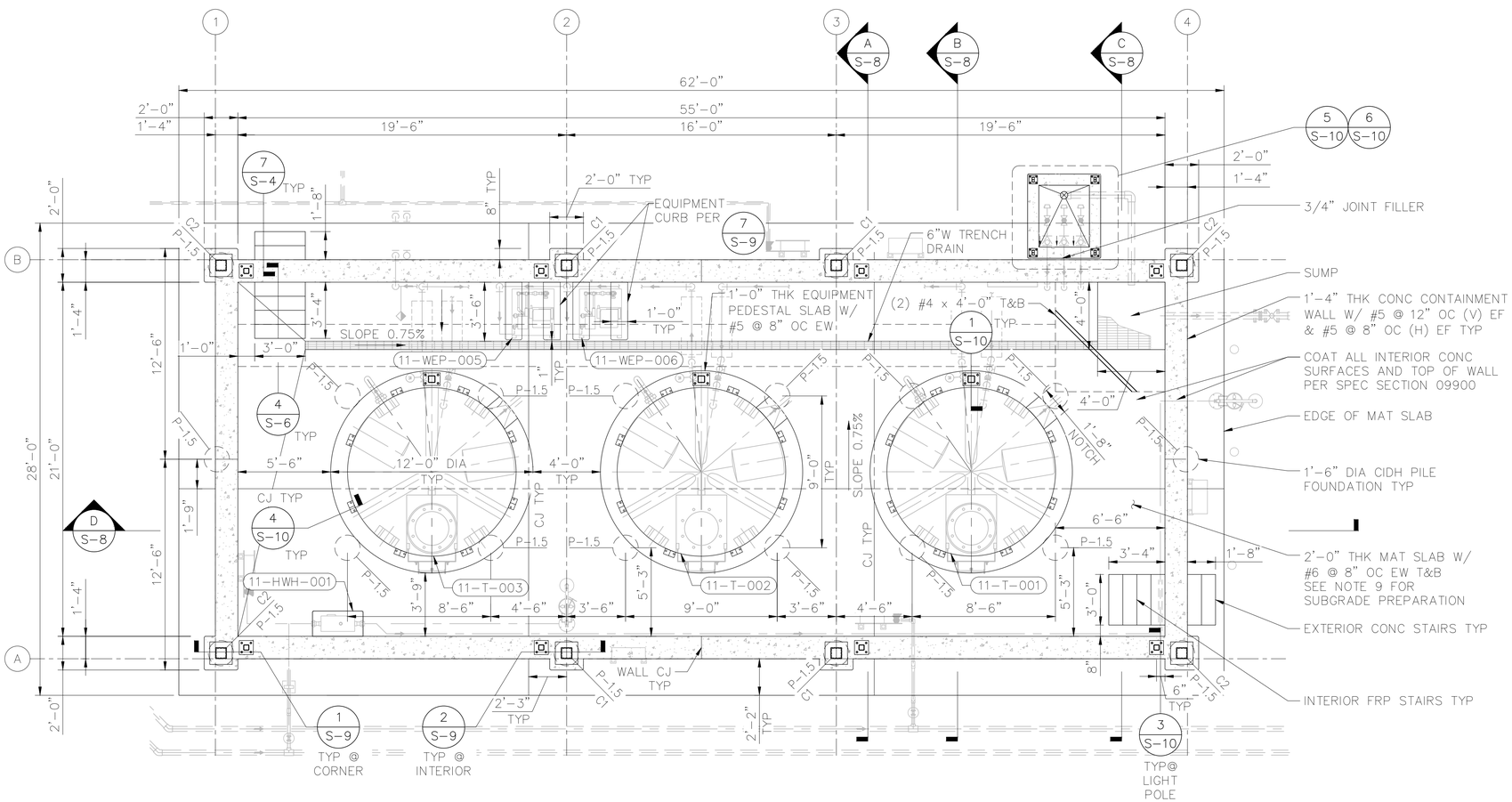
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
STRUCTURAL
TYPICAL DETAILS - 3

SHEET
S-6

27 OF 55

Z:\Shared\cad\110 - dudek\38 - City of Petaluma ECWRF Chemical System Upgrade\Final\DETAILS\15219 S-6 4/29/2024 4:52 PM

34"x22" ORIGINAL SCALE IN INCHES 0 1 2



CHEMICAL STORAGE AREA FOUNDATION PLAN

SCALE: 1/4"=1'-0"

FOUNDATION NOTES:

1. FOR STRUCTURAL GENERAL NOTES, DESIGN CRITERIA AND ABBREVIATIONS REFERENCE S-1, S-2, AND S-3. FOR TYPICAL STRUCTURAL DETAILS SEE SHEET S-4 TO S-6.
2. VERIFY ALL DIMENSIONS AND ELEVATIONS SHOWN ON THESE DRAWINGS PER CIVIL AND MECHANICAL.
3. COORDINATE THE WORK OF ALL TRADES WITH THE STRUCTURAL REQUIREMENTS INDICATED. REFER TO CIVIL AND MECHANICAL DRAWINGS.
4. TOP OF SLAB-ON-GRADE IS THE NOMINAL FIRST FLOOR LINE. FINISHED FLOOR ELEVATION (F.F.EL.) = 13'-0" UON.
5. SLAB-ON-GRADE CONTROL JOINT LOCATIONS SHALL BE APPROVED BY THE ENGINEER PRIOR TO PLACEMENT OF CONCRETE. SPACE A MAXIMUM OF 10'-0" ON CENTER.
6. FOR SIZE AND LOCATION OF DEPRESSED SLABS, SLAB OPENINGS, FLOOR DRAINS AND OTHER REQUIREMENTS NOT INDICATED REFER TO CIVIL, MECHANICAL AND ELECTRICAL DRAWINGS.
7. FOR ITEMS EMBEDDED INTO CONCRETE SLABS AND WALLS NOT INDICATED, REFER TO CIVIL, MECHANICAL AND ELECTRICAL DRAWINGS.
8. FOR NATURE AND EXTENT OF DRAINS, SLUMPS, EXTERIOR HARDSCAPE, ETC. REFER TO CIVIL AND MECHANICAL DRAWINGS.
9. FOUNDATION SHALL BE UNDERLAIN BY A 15-MIL VAPOR RETARDER OVER 6-INCH THICK CAPILLARY BREAK LAYER CONSISTING OF 3/4" CRUSHED ROCK CONFORMING TO REQUIREMENTS OF ASTM C33 COURSE AGGREGATE NO. 6.
10. SEE DETAILS 5, 6, 7, & 8/S-6 FOR TYPICAL PIPE SUPPORT DETAILS. LOCATE SUPPORTS AS REQUIRED BASED ON ACTUAL PIPE AND VALVE INSTALLATION.

LEGEND:

- CIDH PILE FOUNDATION SEE PLAN & SCHEDULE FOR SIZE & REINF
- CONCRETE WALL
- STEEL EMBED COLUMN PER SCHEDULE

COLUMN SCHEDULE				
MARK	SIZE	ANCHOR BOLTS	BASE PLATE	DETAIL
C1	HSS8x8x5/8	(4) 3/4" DIA	PL 1'-0"x1'-2"x1" THK	4/S-9
C2	HSS8x8x5/8	(3) 3/4" DIA	PL 1'-0" SQ x1" THK	3/S-9

CIDH PILE FOUNDATION SCHEDULE			
MARK	DIAMETER	LONGITUDINAL REINF	TRANSVERSE REINF
P-1.5	1'-6"	(8) #7	#3 SPIRAL W/ 8" PITCH(1,2)

1. #3 CLOSED HOOPS MAY BE PROVIDED AS AN ALTERNATIVE.
2. MAX PITCH/HOOP SPACING SHALL BE REDUCED TO 4" IN UPPER 5'-0" OF CIDH PIER.

EQUIPMENT ANCHORAGE SCHEDULE (SS 316L)			
MARK	MAX WT (LBS)	MIN ANCHOR BOLTS	EMBED
11-T-001	62,000	(16) 7/8" DIA HEADED AB(1)	10" MIN(2)
11-T-002	62,000	(16) 7/8" DIA HEADED AB(1)	10" MIN(2)
11-T-003	62,000	(16) 7/8" DIA HEADED AB(1)	10" MIN(2)
11-HWH-001	500	(4) 3/4" DIA EPOXY AB	8" MIN
11-WEPS-005	250	(4) 5/8" DIA EPOXY AB	6" MIN
11-WEPS-006	250	(4) 5/8" DIA EPOXY AB	6" MIN

1. PROVIDE A MINIMUM OF (8) ANCHOR POINTS. PROVIDE ANCHOR STRAPS AT A MINIMUM OF (4) ANCHOR POINTS.
2. EMBED SHALL BE A MINIMUM OF 24" AT ANCHOR STRAP LOCATIONS.

KELEY STRUCTURAL
DEAN ALDEN KEL No. 7726
DEAN@KELEYSTRUCTURAL.COM
415.930.1382

DATE: 04/29/2024
DESIGNED BY: MS
DRAWN BY: AM
CHECKED BY: DI

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER DEAN ALDEN KELEY No. 6099 STRUCTURAL STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

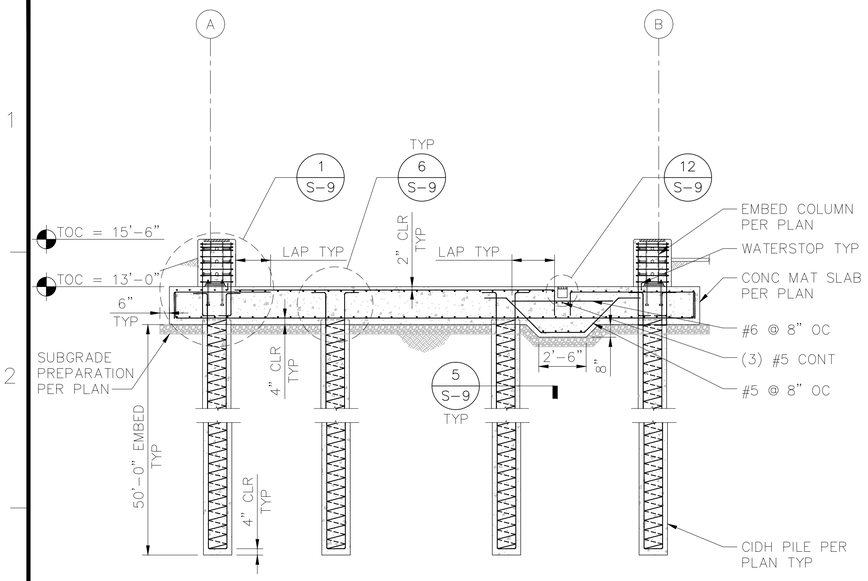
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
STRUCTURAL
CHEMICAL STORAGE AREA FOUNDATION PLAN

SHEET
S-7

28 OF 55

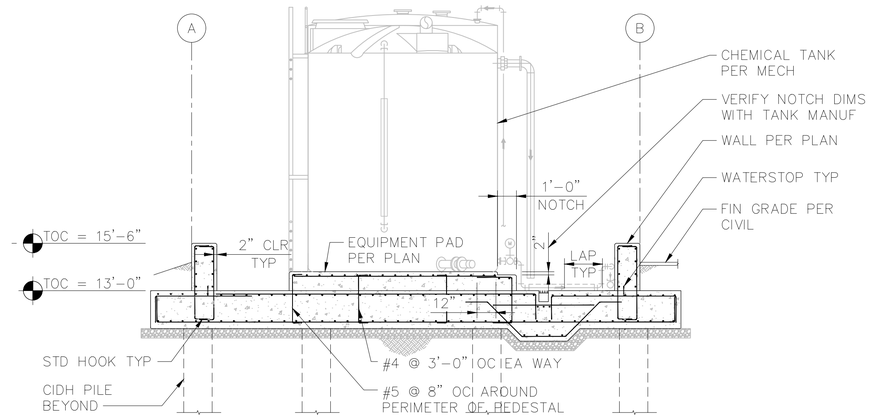
34"x22" ORIGINAL SCALE IN INCHES 0 1 2

Z:\Shared\cad\110 - dudek\38 - city of petaluma ecwtf chemical system upgrade\Final\PLANS\15219 S-7 4/29/2024 4:53 PM



CHEMICAL STORAGE AREA SECTION — A / S-7

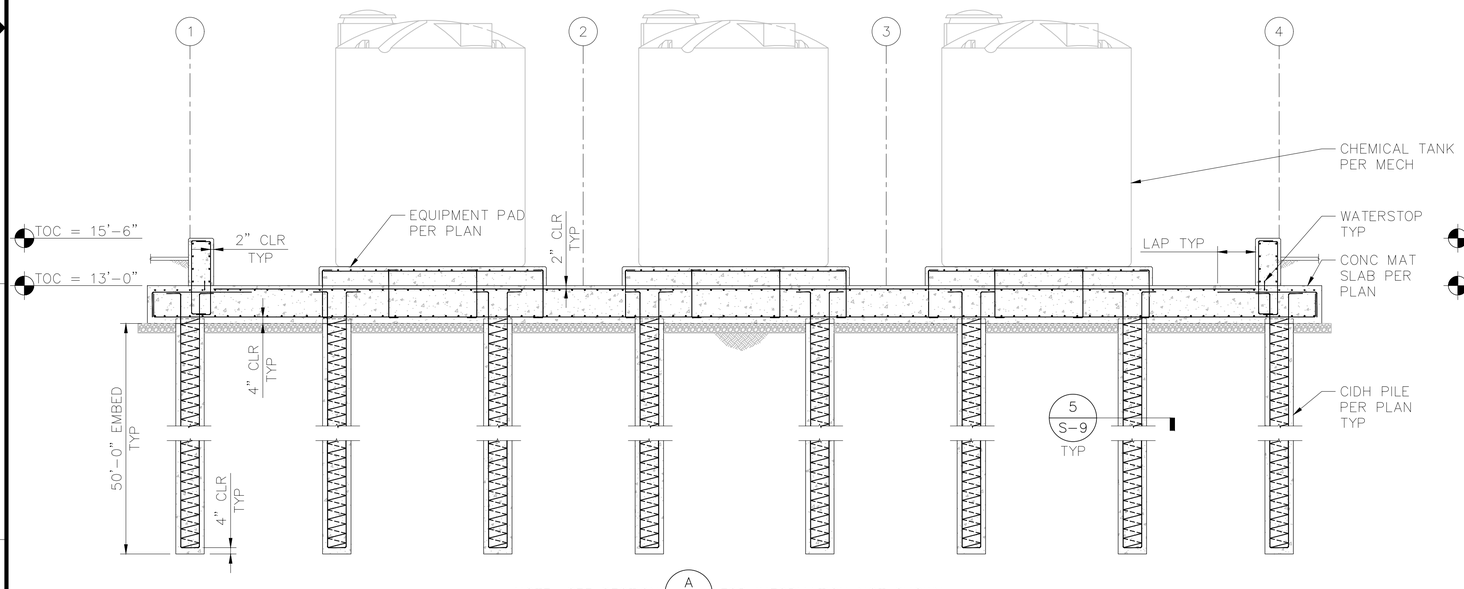
SCALE: 1/4"=1'-0"



NOTE: SEE SECTION A/— FOR INFORMATION NOT SHOWN.

CHEMICAL STORAGE AREA SECTION — B / S-7

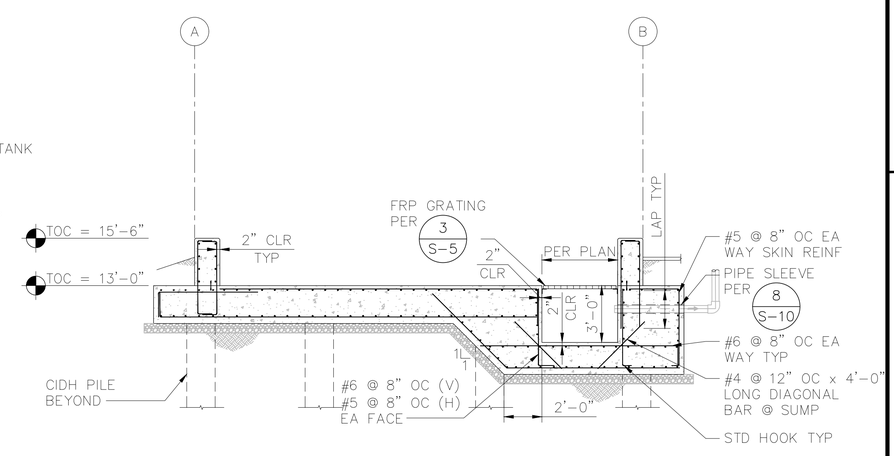
SCALE: 1/4"=1'-0"



NOTE: SEE SECTION A/— FOR INFORMATION NOT SHOWN.

CHEMICAL STORAGE AREA SECTION — D / S-7

SCALE: 1/4"=1'-0"



NOTE: SEE SECTION A/— FOR INFORMATION NOT SHOWN.

CHEMICAL STORAGE AREA SECTION — C / S-7

SCALE: 1/4"=1'-0"

KELLEY STRUCTURAL
DESIGN ALLIANCE, INC. No. 1708
1404 FRANKLIN ST. #602
OAKLAND, CA 94612
415.932.1382
www.kelleystructural.com

DATE: 04/29/2024
DESIGNED BY: MS
DRAWN BY: AM
CHECKED BY: DI

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER — 6099 — MICHAEL P. KELLEY — STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

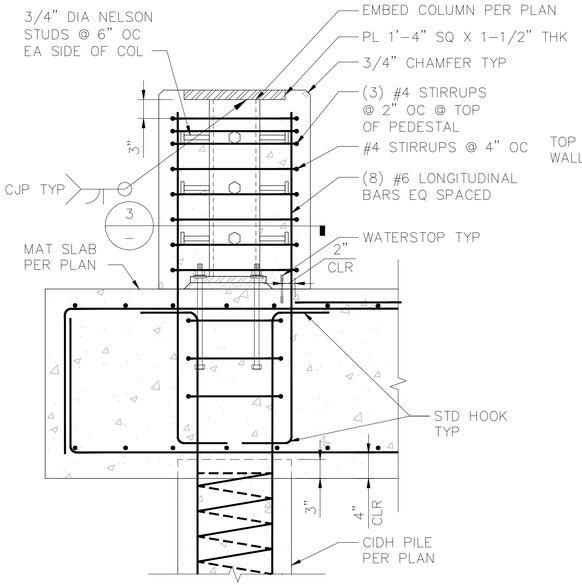
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
STRUCTURAL
CHEMICAL STORAGE AREA SECTIONS

SHEET
S-8

29 OF 55

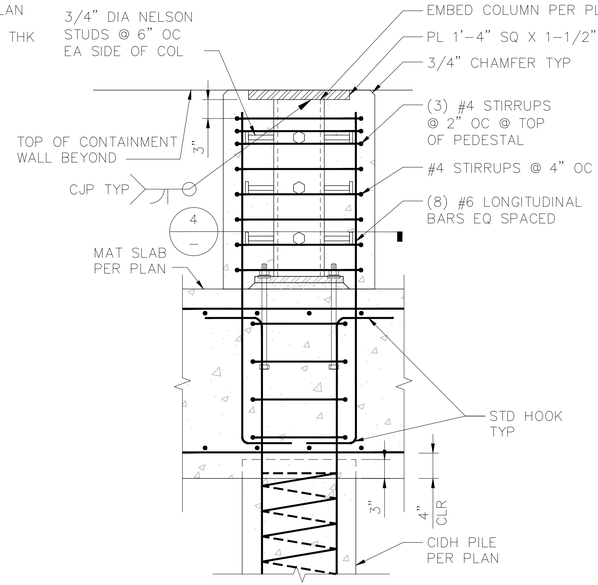
3/4"x22" ORIGINAL SCALE IN INCHES 0 1 2

Z:\Shared\cad\110 - dudek\38 - city of petaluma ecwf chemical system upgrade\Final\SECTIONS\15219 S-8 4/29/2024 4:53 PM



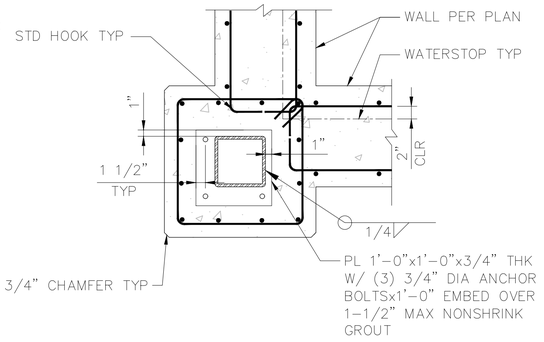
CORNER COLUMN PEDESTAL DETAIL — 1 / S-7

SCALE: 1"=1'-0"



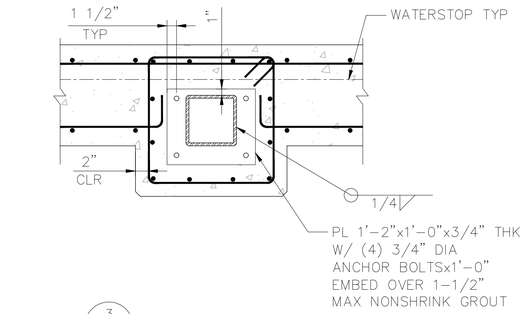
INTERIOR COLUMN PEDESTAL DETAIL — 2 / S-7

SCALE: 1"=1'-0"



CORNER COLUMN PEDESTAL DETAIL — 3 / –

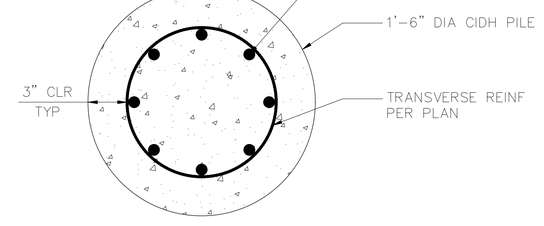
SCALE: 1"=1'-0"



NOTE: SEE 3 / – FOR INFORMATION NOT SHOWN.

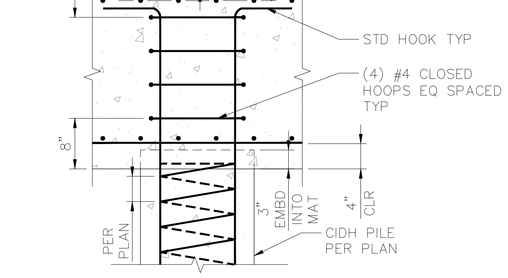
INTERIOR COLUMN PEDESTAL DETAIL — 4 / –

SCALE: 1"=1'-0"



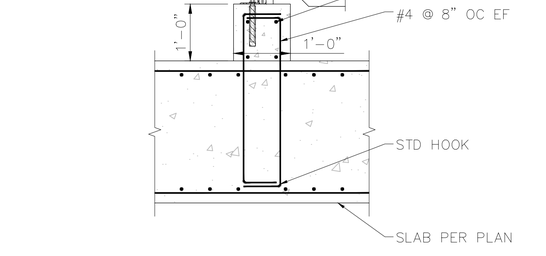
CIDH PILE DETAIL — 5 / S-8

SCALE: 2"=1'-0"



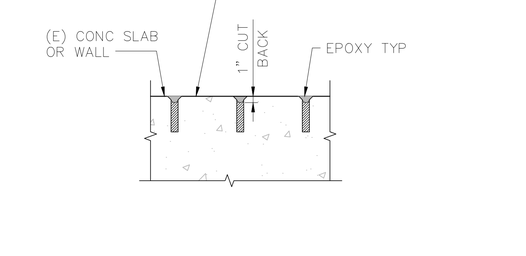
CIDH PILE DETAIL — 6 / S-8

SCALE: 1"=1'-0"



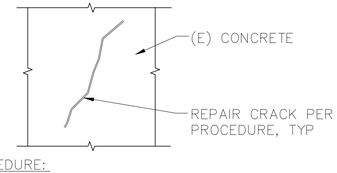
EQUIPMENT CURB DETAIL — 7 / S-7

SCALE: 3/4"=1'-0"



EXPOSED ANCHOR/ REINFORCING REPAIR DETAIL — 8 / –

NTS



REPAIR PROCEDURE:

CONDITION A:

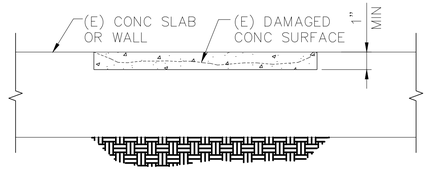
1. CRACK WIDTH EXCEEDS 1/8 INCH CHIP OUT AND REMOVE ALL SOFT CONCRETE AND UNSOUND MATERIAL. ANY CORRODED REBAR SHALL BE CLEANED TO NEAR WHITE METAL.
2. APPLY SCRUB COAT FOR BOND ENHANCEMENT FROM NEW GROUT TO EXISTING CONCRETE AND STEEL.
3. HAND PATCH WITH REPAIR MORTAR SUCH AS SIKATOP123 PLUS OR APPROVED EQUAL TO REFORM ORIGINAL SECTION.
4. VERIFY CONCRETE REPAIR INSTALLATION USING A BALL PEEN HAMMER.

CONDITION B:

1. CRACK WIDTH IS LESS THAN 1/8 INCH REPAIR CRACKS WITH EPOXY GROUT SUCH AS SIKADUR HI-MOD OR APPROVED EQUAL PER MANUFACTURER'S INSTRUCTIONS.

CONCRETE CRACK REPAIR DETAIL — 9 / –

NTS

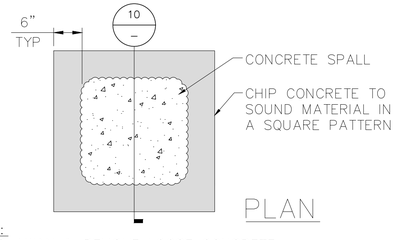


NOTES:

1. SAW CUT PERIMETER TO 1" MIN DEPTH OR UNTIL SOUND MATERIAL IS REACHED.
2. SQUARE ALL EDGES WITH A MAXIMUM OF 6 CORNERS.
3. REMOVE ALL SOFT CONCRETE.
4. APPLY SCRUB COAT FOR BOND ENHANCEMENT FROM NEW GROUT TO EXISTING CONC.
5. HAND PATCH WITH REPAIR MORTAR SUCH AS SIKATOP 123 PLUS OR APPROVED EQUAL TO REGAIN ORIGINAL SECTION.
6. VERIFY CONCRETE REPAIR INSTALLATION USING A BALL PEEN HAMMER.

CONCRETE W/O REBAR EXPOSED REPAIR DETAIL — 10 / –

NTS

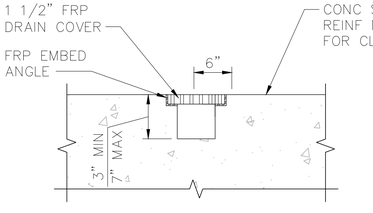


NOTES:

1. CHIP AWAY & REMOVE LOOSE CONCRETE.
2. CONC SURFACE PREPARATION BETWEEN EXISTING AND NEW CONC PLACEMENT:
   A. SANDBLAST (E) CONCRETE SURFACE TO 1/4" AMPLITUDE.
   B. BLOW OFF EXCESS DUST AND VERIFY SURFACE IS FREE OF OILS AND CHEMICALS.
   C. SURFACE SHOULD BE SATURATED DRY (SSD) AFTER CLEANING WITH WATER.
3. PATCH WITH SIKATOP 123 PLUS OR APPROVED EQUIVALENT.

CONCRETE SPALL REPAIR DETAIL — 11 / –

NTS



TRENCH DRAIN DETAIL — 12 / S-8

NTS

KELLEY STRUCTURAL ENGINEERING 1546 ALDEN AVE, No. 1726 SANTA ROSA, CA 95401 619.920.1282

DATE: 04/29/2024 | DESIGNED BY: MS | DRAWN BY: AM | CHECKED BY: DI

PROJECT NO. C66501840

REGISTERED PROFESSIONAL ENGINEER CHRISTOPHER M. KELLEY 6099 CALIFORNIA STATE OF

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

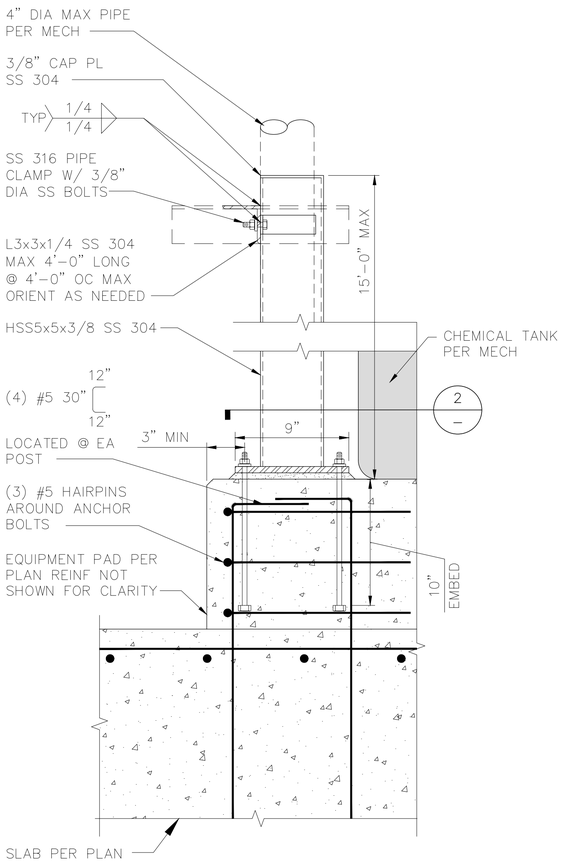
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
STRUCTURAL DETAILS - 1

SHEET S-9

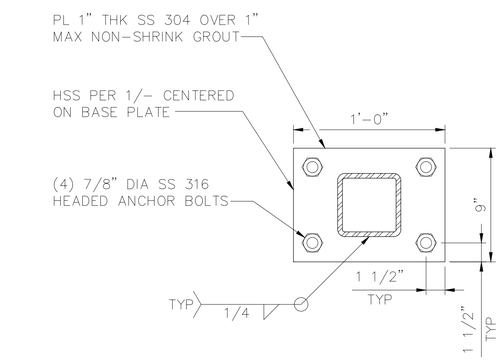
30 OF 55

34"x22" ORIGINAL SCALE IN INCHES 0 1 2

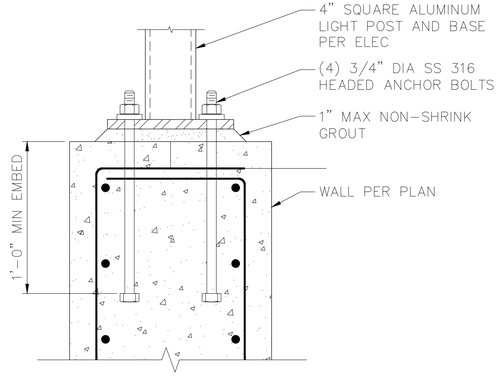
Z:\Shared\cad\110 - dudek\38 - city of petaluma ecwrf chemical system upgrade\Final\DETAILS\15219 S-9 4/29/2024 4:53 PM



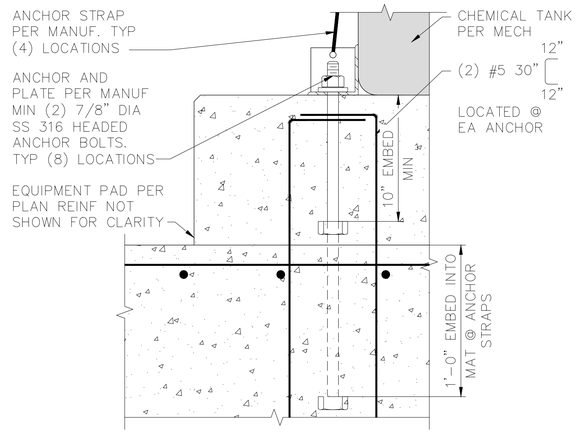
CANTILEVER PIPE SUPPORT DETAIL 1
SCALE: 2"=1'-0"



PIPE SUPPORT BASE PLATE DETAIL 2
SCALE: 2"=1'-0"



LIGHT POLE BASE PLATE DETAIL 3
SCALE: 2"=1'-0"



CHEMICAL TANK ANCHORAGE 4
SCALE: 2"=1'-0"

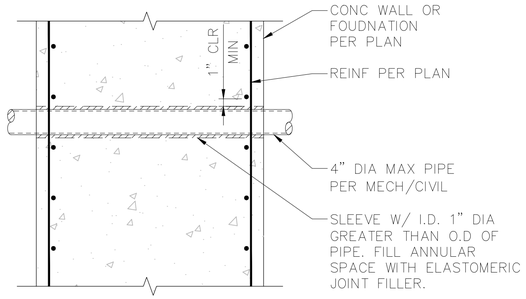
FILL STATION FOUNDATION PLAN 5
SCALE: 1"=1'-0"

NOTE: SEE DETAIL 5/- FOR INFORMATION NOT SHOWN

FILL STATION FRAMING PLAN 6
SCALE: 1"=1'-0"

NOTE: SEE DETAIL 5/S-5 FOR INFORMATION NOT SHOWN

FILL STATION WALL SECTION 7
SCALE: 1"=1'-0"



PIPE THRU WALL/FDN DETAIL 8
NTS

KELEY STRUCTURAL
DEAN ALDEN KEY, No. 7726
1400 N. McDOWELL BLVD.
STE 300
PETALUMA, CA 94954
(415) 332-1382
www.keleystructural.com

DATE: 04/29/2024
DESIGNED BY: MS
DRAWN BY: AM
CHECKED BY: DI

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER DEAN ALDEN KEY 6099 STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
STRUCTURAL DETAILS - 2

SHEET
S-10
31 OF 55

34"x22" ORIGINAL SCALE IN INCHES 0 1 2

Z:\Shared\cad\110 - dudek\38 - City of Petaluma ECWRF Chemical System Upgrade\Final\DETAILS\152191 S-10 4/29/2024 4:53 PM

FITTING SYMBOLS

FITTINGS SHOWN WITH FLANGED JOINTS

- 90° ELBOW
- 90° ELBOW UP
- 90° ELBOW DOWN
- 45° ELBOW
- 45° ELBOW UP
- 45° ELBOW DOWN
- TEE
- TEE UP
- TEE DOWN
- CROSS
- LATERAL WYE
- LATERAL WYE DOWN
- LATERAL WYE UP
- CONCENTRIC REDUCER
- ECCENTRIC REDUCER

VALVE SYMBOLS

VALVES SHOWN WITH FLANGED JOINTS

- PLUG VALVE
- BALL VALVE
- CHECK VALVE (ARROW INDICATES FLOW DIRECTION)
- GATE VALVE
- BUTTERFLY VALVE
- GLOBE VALVE
- MOTOR OPERATED VALVE (BUTTERFLY VALVE SHOWN)
- METER

PIPING SYMBOLS

- EXISTING PIPE
- NEW PIPE (ABOVE GROUND)
- NEW PIPE (BELOW GROUND)
- EXISTING PIPE TO BE REMOVED OR ABANDONED (AS NOTED)
- FLANGED JOINT
- MECHANICAL JOINT
- GROOVED END JOINT (VICTAULIC COUPLING)
- WELDED JOINT
- SLEEVE TYPE MECHANICAL COUPLING
- PW — POTABLE WATER (BURIED)
- S — SEWER (BURIED)
- E — ELECTRICAL (BURIED)
- NPW — NON-POTABLE WATER (BURIED)

PIPE AND EQUIPMENT DESIGNATIONS

EQUIPMENT CALL OUT: 11-MXR-001
- 11 — PROCESSES AREA
- MXR — EQUIPMENT CODE (PER THIS DWG)
- 001 — EQUIPMENT NUMBER, SEE SPECIFICATIONS

PIPING CALL OUT: 6" PW-## NEW; 6" PW EXISTING
- 6" — PIPE DIAMETER SIZE
- PW — PIPING SERVICE IDENTIFICATION (PER THIS DWG)
- ## — GROUP NUMBER, SEE PIPING SCHEDULE ON DWG G-3

CHANGE IN PIPING MATERIAL

PHOTO CALLOUT ARE REFERENCED BY

A/X-X
- A — PHOTO LETTER
- X-X — DRAWING WHERE PHOTO IS LOCATED

PHOTO A — PHOTO LETTER

EQUIPMENT LIST

Equipment No.	Equipment Type	Equipment Description	Spec Section
11-CMP-005	PERISTALTIC CHEMICAL METERING PUMP	SODIUM HYPOCHLORITE METERING PUMP NO. 1	11430
11-CMP-006	PERISTALTIC CHEMICAL METERING PUMP	SODIUM HYPOCHLORITE METERING PUMP NO. 2	11430
11-T-001	CHEMICAL STORAGE TANK	SODIUM HYPOCHLORITE STORAGE TANK NO. 1	11321
11-T-002	CHEMICAL STORAGE TANK	SODIUM HYPOCHLORITE STORAGE TANK NO. 2	11321
11-T-003	CHEMICAL STORAGE TANK	SODIUM HYPOCHLORITE STORAGE TANK NO. 3	11321
11-HWH-001	HOT WATER HEATER	HOT WATER HEATER	15485
11-MXR-001	MECHANICAL MIXER	MECHANICAL MIXER	11312
11-SMP-001	CENTRIFUGAL SAMPLE PUMP	CHLORINE ANALYZER SAMPLE PUMP NO. 1	11330
11-SMP-002	CENTRIFUGAL SAMPLE PUMP	CHLORINE ANALYZER SAMPLE PUMP NO. 2	11330

PIPING SERVICE IDENTIFICATION

D	DRAIN
HW	HOT WATER
PVC	POLYVINYL CHLORIDE PIPE
S	SEWER
SA	SAMPLE
SH	SODIUM HYPOCHLORITE
TD	TANK DRAIN
V	VENT
WSP	WELDED STEEL PIPE
1W	POTABLE WATER
3W	RECYCLED WATER

EQUIPMENT CODE

CMP	SODIUM HYPOCHLORITE METERING PUMP
EWS	EYE WASH AND SHOWER
HWH	HOT WATER HEATER
MOV	MOTOR OPERATED VALVE
MXR	MIXER
SMP	CHLORINE ANALYZER SAMPLE PUMP
T	CHEMICAL TANK

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024 | DESIGNED BY: A. HESS | DRAWN BY: N. HUNTER | CHECKED BY: M. METTS

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER — JAMES MICHAEL METTS — No. 42588 — CIVIL — STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
MECHANICAL
GENERAL NOTES AND SYMBOLS

SHEET
M-1

34"x22" ORIGINAL SCALE IN INCHES 0 1 2

P:\101 Engineering\Petaluma, City of\15219_EQ\WRF Chemical System Upgrade\6-CAD\15219 SHS2 M-01.dwg 04/29/2024 16:48

POND 9

POND 9

WETLANDS PUMP STATION (WEPS) SEE M-6

1" 3W-2

CONCRETE PAVEMENT

LVPB-24

1/2" X 2" SH-4 (4)

1/2" X 2" SH-4

HVPB-20

11-SW30-A BUILDING

TFMR-A

(2) (TYP)

ASPHALT PAVEMENT

(5)

26"-TWE

(4) 1/2" X 2" SH-4

24"-TWE

42"-W

IBP-19B

HVBP-19

ELEC BOX

3" 3W-2

3" 1W-1

11-CHEMICAL STORAGE AREA SEE M-3

6" D-5 SEE SHEET C-6

4" D-5

ABAND SEE NOTE 5 1-1/2" SH

3" 3W-2

CONCRETE PAVEMENT

ASPHALT PAVEMENT

3" 1W-1

(5)

PLAN
SCALE: 1/8"=1'-0"

NOTES:

1. FOR CONTINUATION OF PIPING AND SITE IMPROVEMENTS SEE CIVIL SHEETS.
2. FOR PIPE SCHEDULE SEE SHEET G-3
3. FOR EQUIPMENT LIST AND SYMBOLS SEE SHEET M-1.
4. FOR ELECTRICAL IMPROVEMENTS SEE E DRAWINGS.
5. USE OF THE EXISTING SODIUM HYPOCHLORITE DOSING SYSTEM WILL BE REQUIRED DURING THE CONSTRUCTION PHASE, UNTIL THE THE PROPOSED SODIUM HYPOCHLORITE DOSING SYSTEM IS INSTALLED, TESTED AND IN OPERATION. DEMOLITION OF THE EXISTING DOSING SYSTEM SHALL NOT COMMENCE UNTIL APPROVED BY THE CITY OF PETALUMA STAFF.
6. NO VEHICULAR TRAFFIC ON ANY PORTION OF WEPS STRUCTURE.

CONSTRUCTION LEGEND

(1) HOSE BIBB AND RACK PER DTL 1 ON DWG M-8 (TYPE III)
(2) BOLLARD PER DTL 2 ON DWG M-8
(3) INSTALL NEW MAGNETIC FLOW METERS PER ELECTRICAL SHEETS
(4) INSTALL SECOND PARALLEL SH LINE. CAP PIPE ABOVE GROUND AT EACH END
(5) HOSE BIBB AND RACK PER DTL 1 ON DWG M-8 (TYPE I)

GRAPHIC SCALE
0 4' 8' 16'
SCALE: 1/8"=1'-0"

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024
DESIGNED BY: A. HESS
DRAWN BY: N. HUNTER
CHECKED BY: M. METTS

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER JAMES MICHAEL METTS No. 42588 CIVIL STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

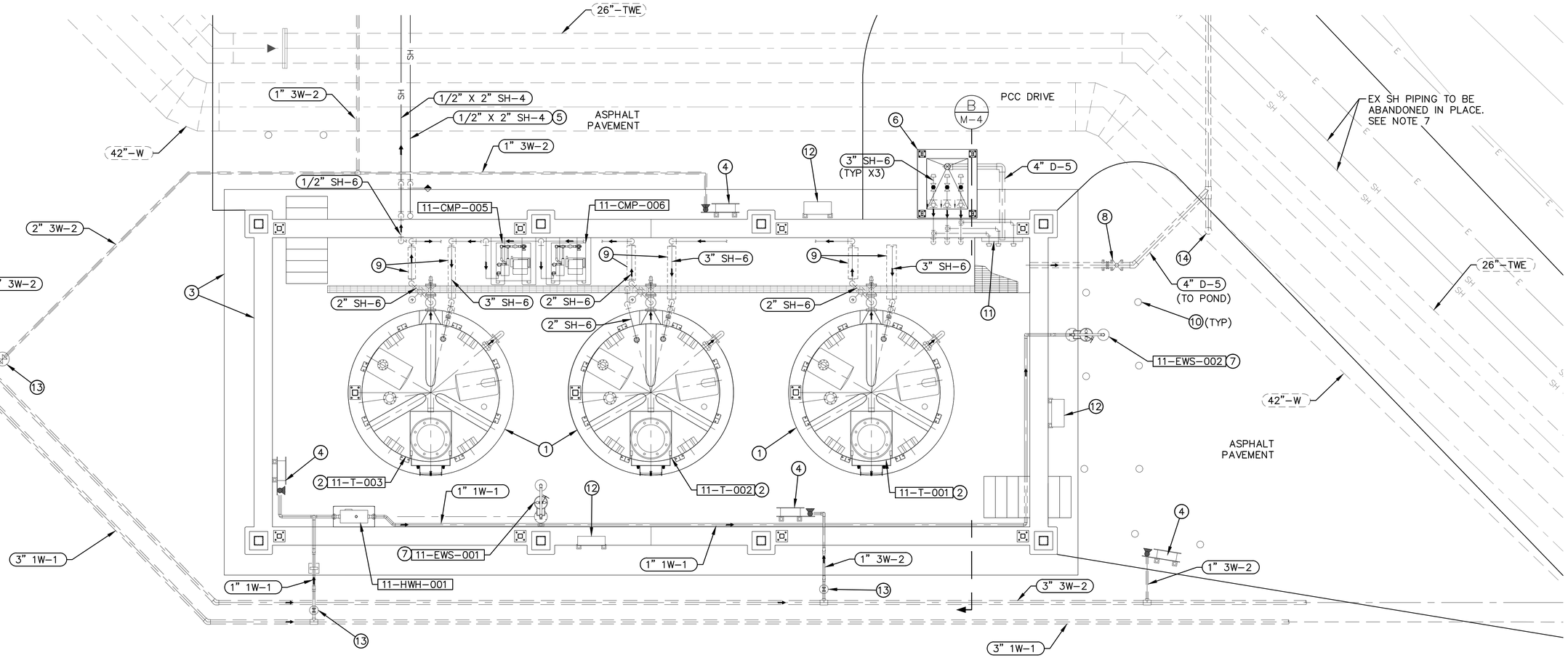
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
MECHANICAL
WEPS AND CHEMICAL STORAGE AREA SITE PLAN

SHEET
M-2

33 OF 55

34"x22" ORIGINAL SCALE IN INCHES 0 1 2

P:\101 Engineering\Petaluma, City of\15219_ECWRF Chemical System Upgrade\6-CAD\15219 SHS3 M-02.dwg 04/29/2024 16:49



PLAN

SCALE: 1/4"=1'-0"

CONSTRUCTION LEGEND

1. CONCRETE TANK BASE PER STRUCTURAL SHEETS
2. 6,600 GAL CHEMICAL STORAGE TANK PER SPECIFICATION SECTION 11321
3. CHEMICAL STORAGE AREA PER STRUCTURAL SHEETS
4. HOSE BIB AND RACK PER DETAIL 1 ON SHEET M-8 (TYPE I)
5. INSTALL SECOND PARALLEL SH LINE. CAP PIPE ABOVE GROUND AT EACH END
6. CHEMICAL AREA FILL STATION PER DWG S-10
7. EYE WASH AND SHOWER PER SPECIFICATION 11500
8. POST INDICATOR VALVE PER SPECIFICATION SECTION 15100
9. 1-CHANNEL DROP OVER PIPE COVER PER SPECIFICATION SECTION 15051
10. BOLLARD PER DETAIL 2 ON SHEET M-8
11. QUICK CONNECTION PANEL FOR TANK BY-PASS
12. LOCAL CONTROL PANEL PER ELECTRICAL SHEETS
13. VALVE AND LOCKING VALVE CAN PER CITY STD DWG 877.01
14. CLEAN OUT PER CITY STANDARD DETAIL 505

NOTES:

1. FOR CONTINUATION OF PIPING AND SITE IMPROVEMENTS SEE CIVIL SHEETS.
2. FOR PIPE SCHEDULE SEE SHEET G-3
3. FOR EQUIPMENT LIST AND SYMBOLS SEE SHEET M-1
4. FOR ELECTRICAL SITE IMPROVEMENTS SEE E DRAWINGS
5. CHEMICAL TANK ORIENTATION PLAN SEE DETAIL 1 ON SHEET M-4
6. PIPE SUPPORT FOR CHEM TANK PIPING SEE DETAILS 1 & 3 ON SHEET S-11
7. USE OF THE EXISTING SODIUM HYPOCHLORITE DOSING SYSTEM WILL BE REQUIRED DURING THE CONSTRUCTION PHASE, UNTIL THE THE PROPOSED SODIUM HYPOCHLORITE DOSING SYSTEM IS INSTALLED, TESTED AND IN OPERATION. DEMOLITION OF THE EXISTING DOSING SYSTEM SHALL NOT COMMENCE UNTIL APPROVED BY THE CITY OF PETALUMA STAFF.

GRAPHIC SCALE

0 2' 4' 8'

SCALE: 1/4"=1'-0"

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024
DESIGNED BY: A. HESS
DRAWN BY: N. HUNTER
CHECKED BY: M. METTS

PROJECT NO.
C66501840

KENNETH MICHAEL METTS No. 42582 CIVIL STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

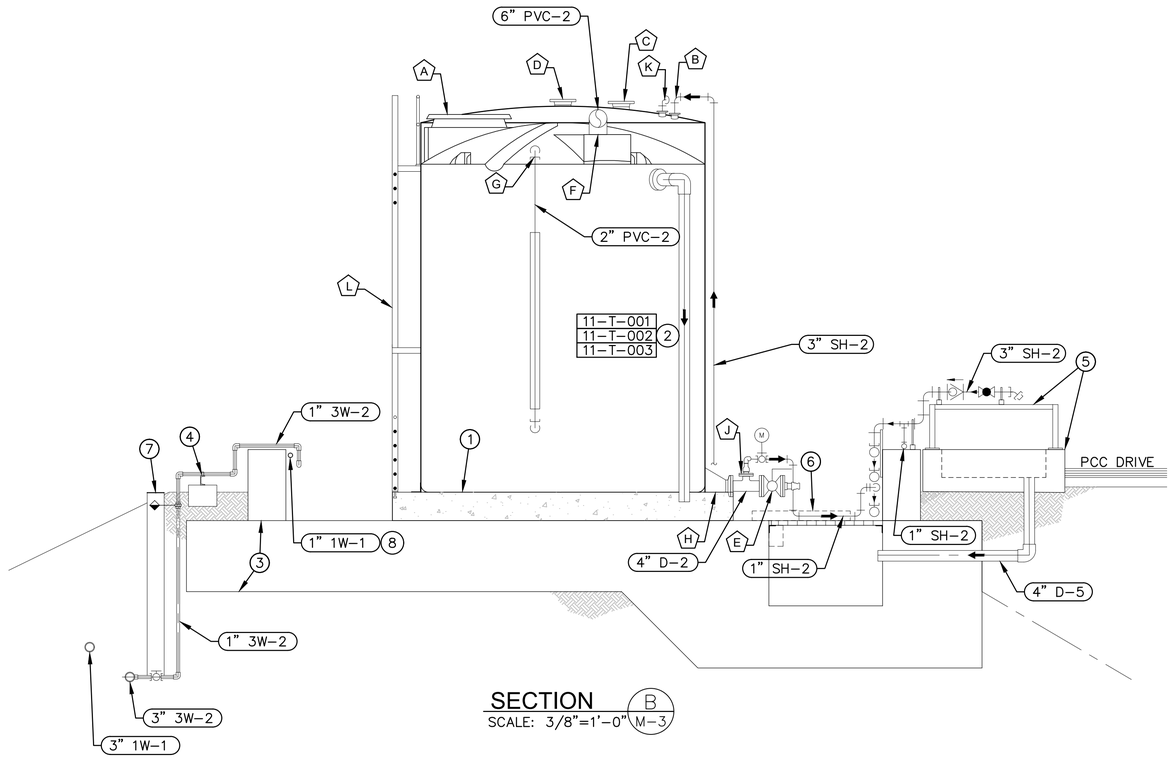
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
MECHANICAL
CHEMICAL STORAGE AREA PLAN

SHEET
M-3

34 OF 55

34"x22" ORIGINAL SCALE IN INCHES 0 1 2

P:\101 Engineering\Petaluma, City of\15219_EGWRF Chemical System Upgrade\6-CAD\15219 SH54 to 35 M-03 to M-04.dwg 08/28/2024 14:53



SECTION B (M-3)
SCALE: 3/8"=1'-0"

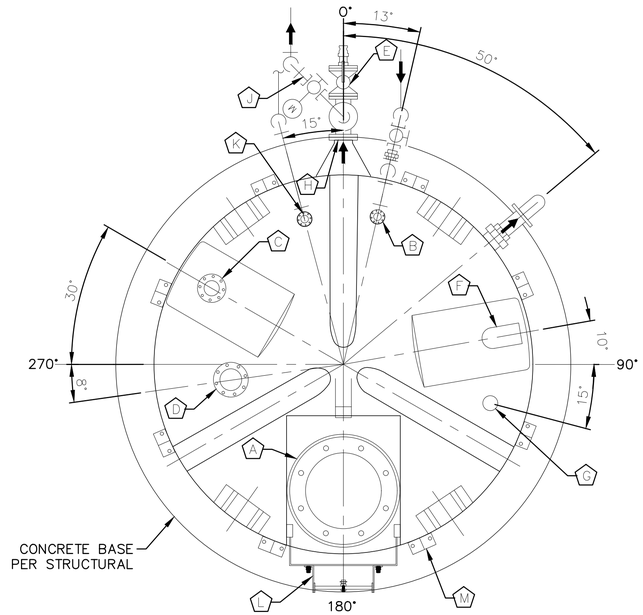
CONSTRUCTION LEGEND

1. CONCRETE TANK BASE PER STRUCTURAL SHEETS
2. 6,600 GAL CHEMICAL STORAGE TANK PER SPECIFICATION SECTION 11321
3. CHEMICAL STORAGE AREA PER STRUCTURAL SHEETS
4. PIPE SUPPORT PER DETAIL 5 ON SHEET M-8
5. CHEMICAL AREA FILL STATION PER DWG S-10
6. 1-CHANNEL DROP OVER PIPE COVER PER SPECIFICATION SECTION 15051
7. VALVE AND LOCKING VALVE CAN PER CITY STD DWG 877.01
8. PIPE SUPPORT PER DTL 4 ON SHEET M-8

NOTES:

1. FOR CONTINUATION OF PIPING AND SITE IMPROVEMENTS SEE CIVIL SHEETS.
2. FOR PIPE SCHEDULE SEE SHEET G-3
3. FOR EQUIPMENT LIST AND SYMBOLS SEE SHEET M-1
4. FOR ELECTRICAL SITE IMPROVEMENTS SEE E DRAWINGS
5. PIPE SUPPORT FOR CHEM TANK PIPING SEE DETAILS 1 & 3 ON SHEET S-11

GRAPHIC SCALE
0 2' 4' 8'
SCALE: 1/4"=1'-0"



10'-0" DIA OD TANKS

	TANK FITTINGS	REMARKS
A	MANWAY 24" - CVR ASMBLY, 8-BLT GSKT, 24" MWY COVER 3/8" PE 32" OD X 24" ID	EL 14'-4" (DOME) OFF TANK BTM
B	TANK FILL 3" - BHF ASMLY 2" STX H' WARD PVC/EPDM FLG ADPT 2" THRD PVC EPDM EXPANSION JOINT 2" ASMLY THRD EPDM/PVC/SS	EL 13'-0" (DOME) OFF TANK BTM AT 4'-0" RADIUS
C	SPARE - 4" UBD FTG, 4" BHF STYLE PVC/EPDM FLG ADPT, 4" THRD PVC BLIND FLG FTG	EL 13'-0" (DOME) OFF TANK BTM AT 4'-0" RADIUS
D	ULTRA SONIC 6" - UBD FTG 6" FLG STLE PVC/TITAN/EPDM FLG ADPT 6" THRD PVC	EL 13'-2" (DOME) OFF TANK BTM AT 3'-0-" RADIUS MAX
E	DRAIN 4" - CFA 4" BALL VLV E J W/FLG SOC PVC/TI/EPDM PTFE EXP JNT RG, W/ 2" QUICK CONNECT	℄ EL 2-1/4" (TANK WALL) OFF TANK BTM
F	VENT 6" - BHF ASMLY 6" SXT H' WARD PCV/EPDM FLG ADPT, 6" THRD PVC EPDM EXPANSION JOINT ASMLY THRD EDPM/PVC/SS	EL 14-4" (DOME) OFF TANK BTM AT 4'-0" RADIUS
G	LEVEL GAGE 2" - LRG FLT YTPE PVC UBD FTG, BHF STYLE PVC/EPDM SUPPORT F/S	EL 12'-8" (DOME) OFF TANK BTM AT 4'-0" RADIUS
H	OVERFLOW 4" - BHF ASLMY, 4" STX U' WARD PCV/PE FLG ADPT 4" THRD PVC EPDM EXPANSION JNT 4" ASMLY THRD EDPM/PVC/SS	℄ EL 0'-0" OFF TANK BTM
J	OUTLET 2" - BHF ASMLY 2" STX H' WARD PVC/EPDM FLG ADPT	4" x 2" TEE
K	TANK DEGAS 2" - BHF ASMLY 2" STX H' WARD PVC/EPDM FLG ADPT 2" THRD PVC EPDM EXPANSION JOINT 2" ASMLY THRD EPDM/PVC/SS (TANK 002 ONLY)	EL 13'-0" (DOME) OFF TANK BTM AT 4'-0" RADIUS
L	FRP LADDER	EXTENDS 12" FROM TANK WALL
M	TANK ANCHORS (PER MANUFACTURE REQUIREMENTS)	

CHEMICAL TANK ORIENTATION PLAN 1 VAR
SCALE: 1/2"=1'-0"

GRAPHIC SCALE
0 1' 2' 4'
SCALE: 1/2"=1'-0"

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024
DESIGNED BY: A. HESS
DRAWN BY: N. HUNTER
CHECKED BY: M. METTS

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
DENNIS MICHAEL METTS
No. 42588
CIVIL
STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

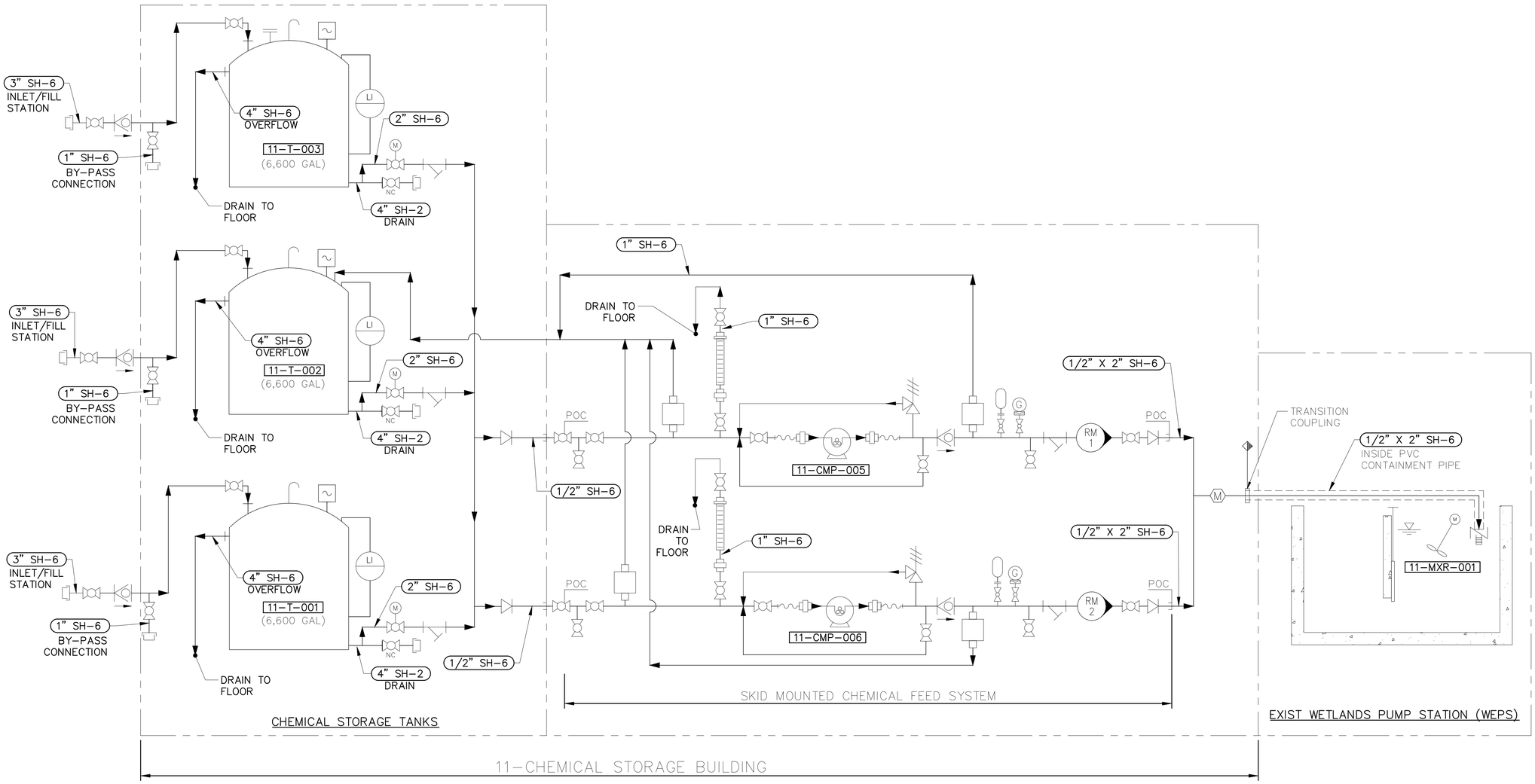
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
MECHANICAL
CHEMICAL STORAGE AREA SECTIONS AND DETAILS

SHEET
M-4

35 OF 55

34"X22" ORIGINAL SCALE IN INCHES 0 1 2

P:\101 Engineering\Petaluma, City of\15219_ECWRF Chemical System Upgrade\6-CAD\15219 St154 to 35 M-03 to M-04.dwg 04/30/2024 08:44



LEGEND

11-T-001 11-T-002 11-T-003	CHEMICAL TANK, DETAIL 1 ON SHEET M-4
	BALL VALVE, CPVC, VENTED WITH HAND LEVER, VITON O-RINGS, TRUE UNION CONNECTIONS. VALVE SIZE TO MATCH LINE SIZE
	NOZZLE (SPARE)
	CHECK VALVE, CPVC, TRUE UNION DIAPHRAGM CHECK, VITON SEALS. VALVE SIZE TO MATCH LINE SIZE
	REDUCER, PVC OR CPVC TO MATCH LINE MATERIAL
	CHEMICAL FILL QUICK CONNECT
	ULTRASONIC LEVEL SENSOR
M	INLINE CHEMICAL FLOW METER
	PERISTALTIC METERING PUMP 11-CMP-005 100 GPH AT 30 PSIG (MAX) 11-CMP-006 100 GPH AT 30 PSIG (MAX)
	PRESSURE RELIEF VALVE, PVC BODY, PTFE PRIMARY DIAPHRAGM SEAL
	INLINE STRAINER
M	MOTOR OPERATED VALVE
	VENT
RM 1	ROTOAMETER
	FLEXIBLE CONNECTION
	CALIBRATION COLUMN
M	CHEMICAL MIXER, FLYGT MODEL 4640 W/ JET RING
	DEGASS VALVE
LI	LEVEL INDICATOR
G	PRESSURE GAUGED
	PULSATION DAMPENER
	FOOT VALVE

NOTES:

1. FOR PIPE SCHEDULE SEE SHEET G-3
2. FOR EQUIPMENT LIST SEE SHEET M-1

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024
DESIGNED BY: A. HESS
DRAWN BY: N. HUNTER
CHECKED BY: M. METTS

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
DAVID MICHAEL METTS
No. 42588
CIVIL
STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

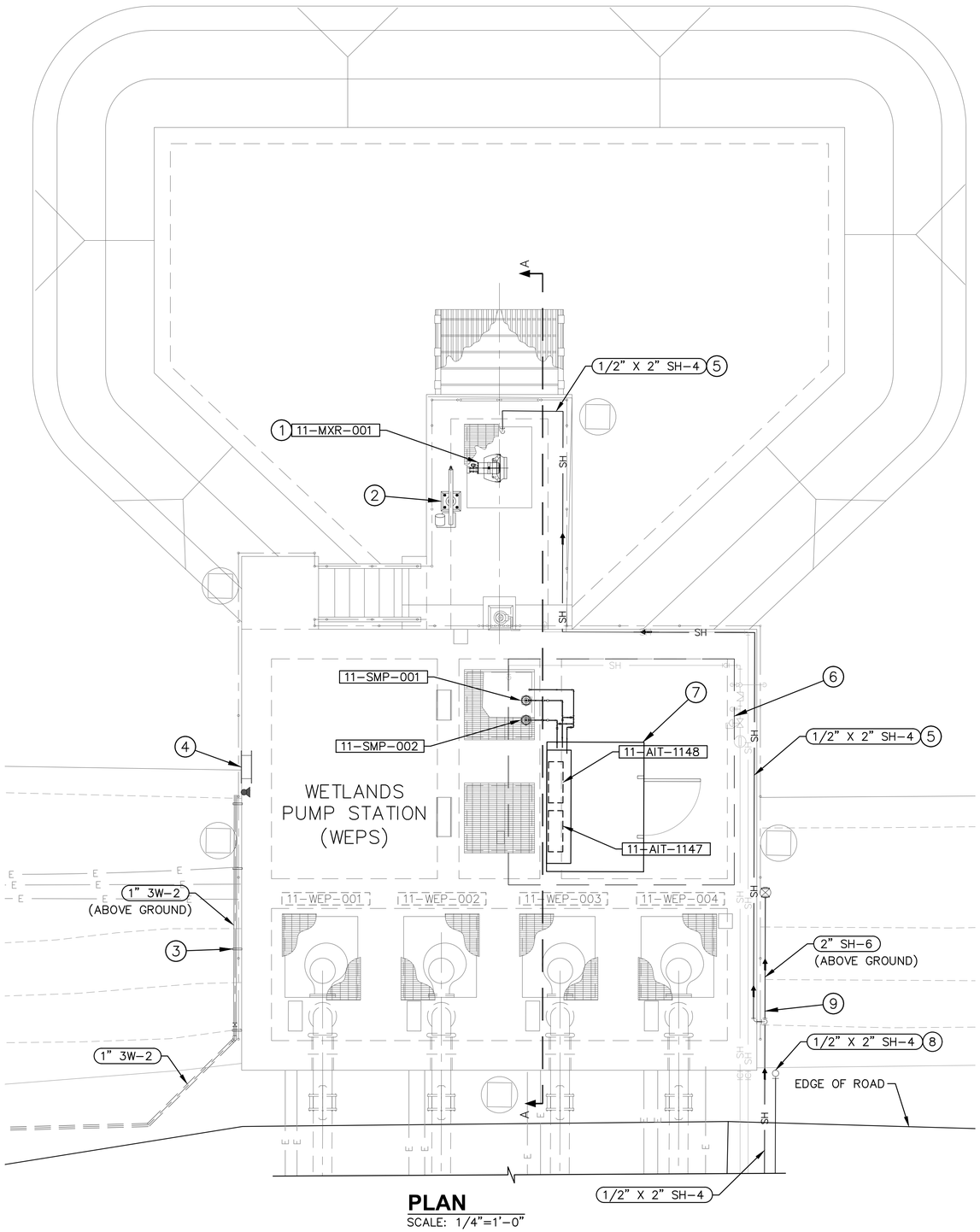
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
MECHANICAL
CHEMICAL FEED SYSTEM SCHEMATIC

SHEET
M-5

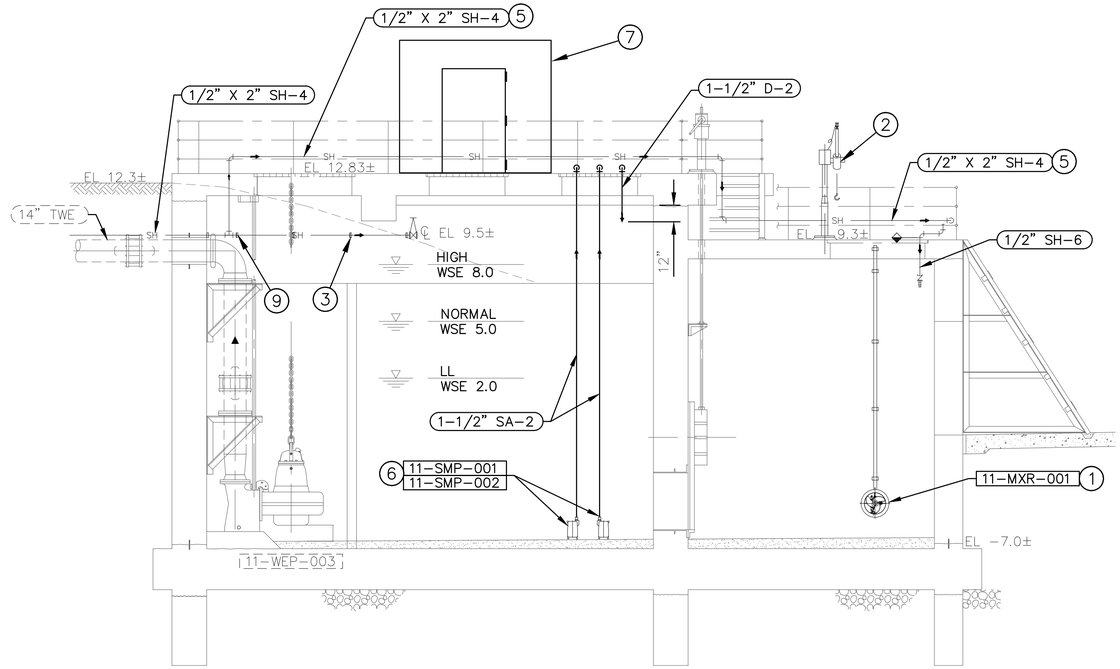
36 OF 55

34"x22" ORIGINAL SCALE IN INCHES 0 1 2

P:\101 Engineering\Petaluma, City of\15219_EOWRF Chemical System Upgrade\8-CAD\15219 SH36 M-05.dwg 04/29/2024 16:56



PLAN
SCALE: 1/4"=1'-0"



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

CONSTRUCTION LEGEND

1. FLYGT COMPACT MIXER (MODEL 4640 W/JET RING)
2. CHEMICAL MIXER UNIT HOIST (SUPPLIED BY MIXER MANUF)
3. PIPE SUPPORT PER DETAIL 3 ON SHEET M-8
4. HOSE BIB AND RACK PER DETAIL 1 ON SHEET M-8 (TYPE III)
5. MOUNT SH PIPING TO GUIDE RAIL PER STRUCTURAL DRAWINGS
6. CHLORINE PUMPS/ANALYZER PER SHEET M-7
7. ANALYZER INCLOSURE, 8'-0"(W) x 6'-0"(D) x 8'-0"(H) PER SPECIFICATION SECTION 13140
8. INSTALL SECOND PARALLEL SH LINE. CAP PIPE ABOVE GROUND AT EACH END
9. TRANSITION TO LOW POINT LEAK DETECTION

NOTES:

1. FOR CONTINUATION OF PIPING AND SITE IMPROVEMENTS SEE CIVIL SHEETS.
2. FOR PIPE SCHEDULE SEE SHEET G-3
3. FOR EQUIPMENT LIST AND SYMBOLS SEE SHEET M-1

GRAPHIC SCALE
0 4' 8' 16'
SCALE: 1/8"=1'-0"

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024
DESIGNED BY: A. HESS
DRAWN BY: N. HUNTER
CHECKED BY: M. METTS

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
JAMES MICHAEL METTS
No. 42588
CIVIL
STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

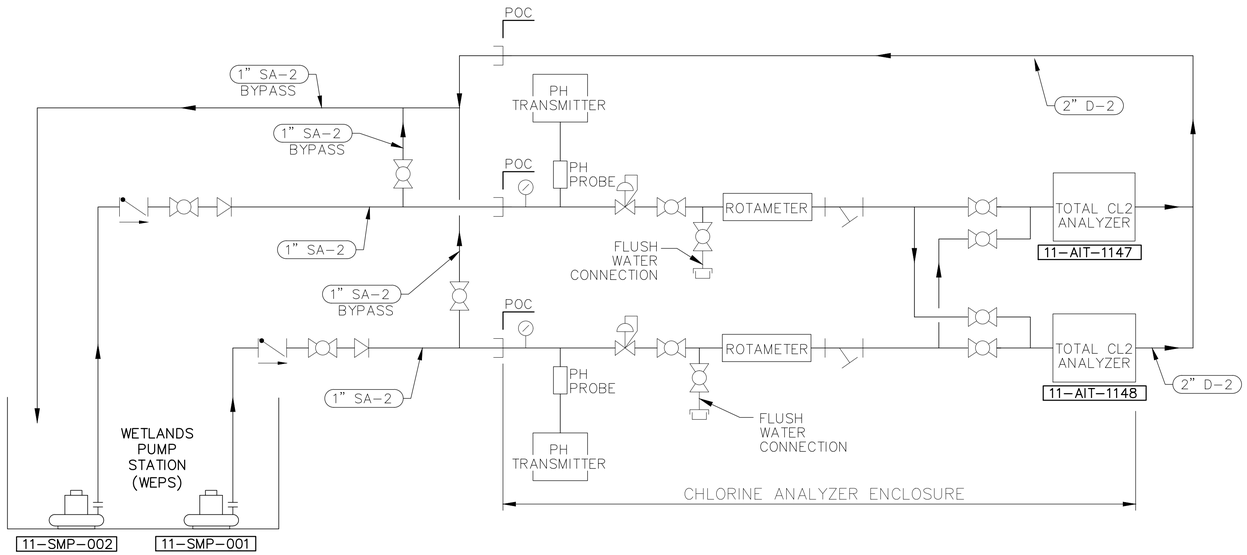
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
MECHANICAL
WETLANDS PUMP STATION PLAN AND SECTION

SHEET
M-6

37 OF 55

34"x22" ORIGINAL SCALE IN INCHES 0 1 2

P:\101 Engineering\Petaluma, City of\15219_ECWRF Chemical System Upgrade\6-CAD\15219 SH37 to 38 M-06 to M-07.dwg 04/29/2024 16:57



TOTAL CHLORINE ANALYZER SCHEMATIC (1)

SCALE: NONE

ENLARGED CHLORINE PUMP PIPING PLAN (2)

SCALE: NONE

LEGEND

11-SMP-001 11-SMP-002	SAMPLE PUMPS
	BALL VALVE, CPVC,
	CHECK VALVE, CPVC, TRUE UNION DIAPHRAGM CHECK. VALVE SIZE TO MATCH LINE SIZE
	REDUCER, PVC OR CPVC TO MATCH LINE MATERIAL
	CHEMICAL FILL QUICK CONNECT
	INLINE STRAINER
	PRV (SET AT 25 PSIG)
	PRESSURE GAUGE
	SUMP PUMP

NOTES:

1. WHERE SCHEMATIC DOES NOT AGREE WITH PIPING SHOWN ON OTHER DRAWINGS, PIPING SHALL BE INSTALLED AS INDICATED ON THE SCHEMATIC.
2. FOR EQUIPMENT LIST AND SYMBOLS SEE SHEET M-1
3. FOR PIPE SCHEDULE SEE SHEET G-3
4. ANALYZER DRAINS REQUIRE A VENTILATION RISER TO BE INSTALLED ABOVE THE LEVEL OF THE ANALYZERS.

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024
DESIGNED BY: A. HESS
DRAWN BY: N. HUNTER
CHECKED BY: M. METTS

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
JAMES MICHAEL METTS
No. 42588
CIVIL
STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

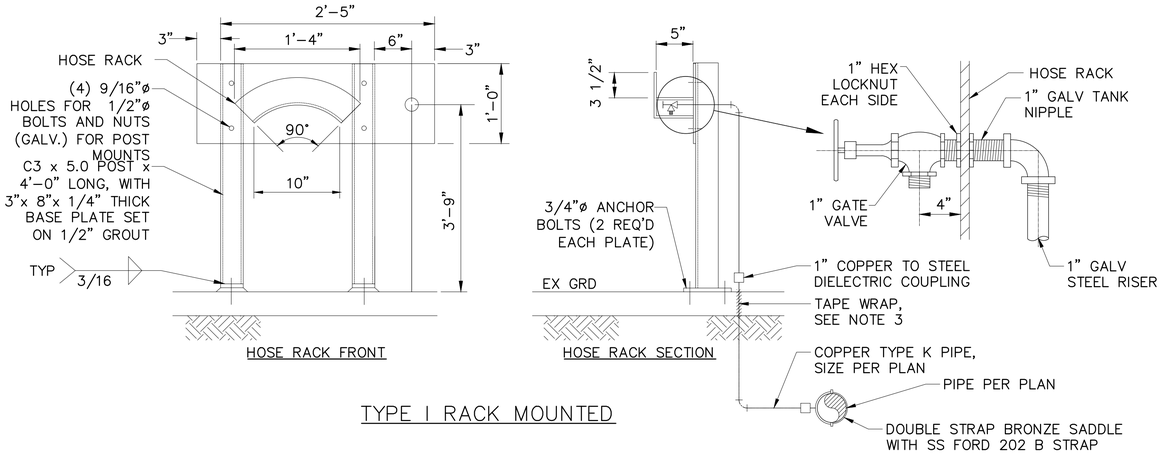
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
MECHANICAL
TOTAL CHLORINE ANALYZER DETAILS

SHEET
M-7

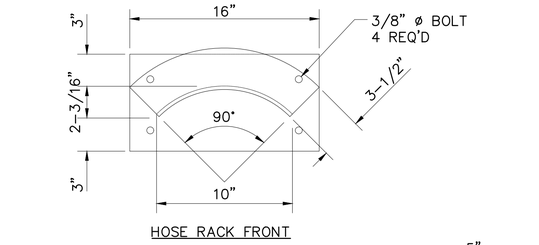
38 OF 55

3.4"x22" ORIGINAL SCALE IN INCHES 0 1 2

P:\101 Engineering\Petaluma, City of\15219_EGWRF Chemical System Upgrade\6-CAD\15219 SH37 to 38 M-06 to M-07.dwg 04/29/2024 16:58



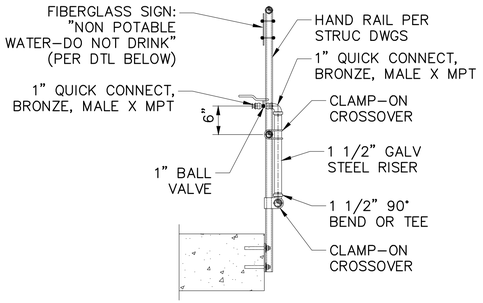
TYPE I RACK MOUNTED



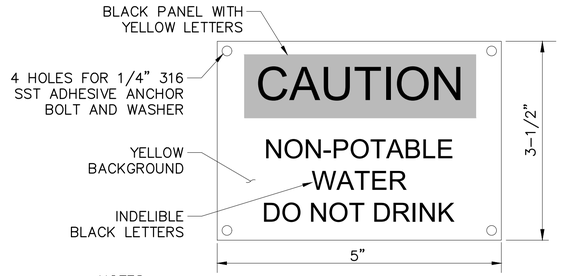
HOSE RACK DETAILS

GENERAL HOSE BIBB NOTES:

1. UTILITY STATION SHALL BE OF ALL WELDED CONSTRUCTION. PLATE MATERIAL SHALL BE MINIMUM 10 GAGE STEEL PLATE, HOT DIP GALVANIZED AFTER FABRICATION. PAINT IN ACCORDANCE WITH SPECIFICATION SECTION 09900.
2. ALL FASTENERS AND MOUNTING HARDWARE SHALL BE HOT DIP GALVANIZED.
3. ALL WALL AND SLAB PENETRATIONS SHALL BE WRAPPED WITH HDPE TAPE, MIN 6" PAST PENETRATION.



TYPE III HANDRAIL MOUNTED



NOTES:

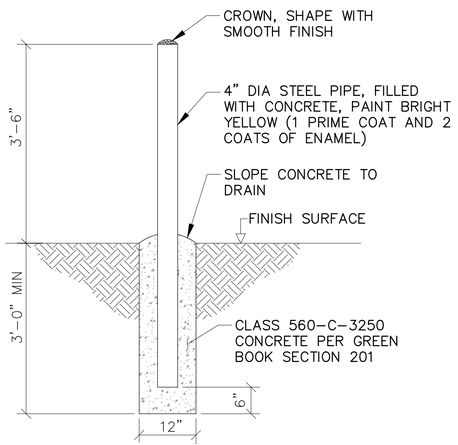
1. COLORS AND LETTERS TO BE PER CAL–OSHA STANDARDS FOR CAUTION SIGNS.
2. PROVIDE THIS SIGN AT ALL HOSE BIBB LOCATIONS WHERE WATER IS NO–POTABLE.

WARNING SIGN FOR NON–POTABLE WATER

HOSE BIBB AND RACK DETAIL

NOT TO SCALE

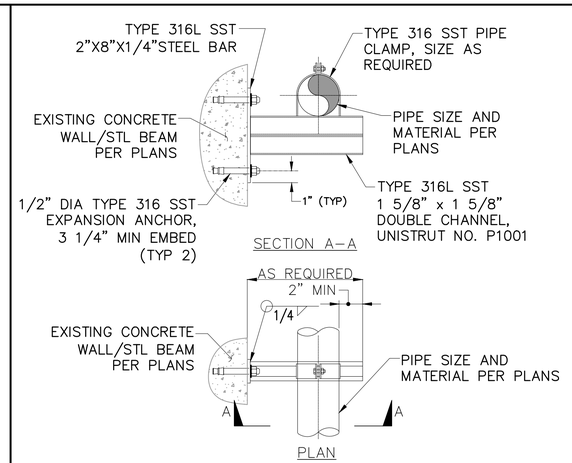
1 VAR



BOLLARD DETAIL

NOT TO SCALE

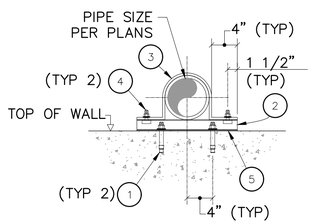
2 VAR



SST CHANNEL PIPE SUPPORT

NOT TO SCALE

3 VAR



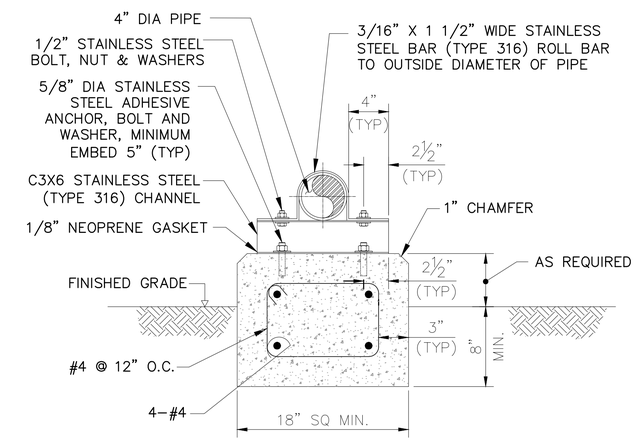
LEGEND

1. 5/8" DIA STAINLESS STEEL WEDGE ANCHOR, 3–1/2" MIN EMBED (TYP)
2. 1–5/8" x 1–5/8" STAINLESS STEEL UNISTRUT CHANNEL (P1000) OR APPROVED EQUAL
3. 3/8" x 1–5/8" STAINLESS STEEL BAR (TYPE 316), ROLL BAR TO OUTSIDE DIAMETER OF PIPE
4. 1/2" STAINLESS STEEL UNISTRUT STUD NUT (P2381–5), NUT AND WASHER OR APPROVED EQUAL
5. 1/8" NEOPRENE GASKET

PIPE SUPPORT ON UNI-STRUT

NOT TO SCALE

4 VAR



PIPE SUPPORT WITH CONCRETE FOOTING

NOT TO SCALE

5 VAR

DUDEK
605 Third Street
Encinitas, CA
92024 760.942.5147

DATE: 04/30/2024
DESIGNED BY: A. HESS
DRAWN BY: N. HUNTER
CHECKED BY: M. METTS

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER JAMES MICHAEL METTS No. 42588 CIVIL STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
MECHANICAL
DETAILS - 1

SHEET
M-8

39 OF 55

34"x22" ORIGINAL SCALE IN INCHES

P:\101 Engineering\Petaluma, City of\15219_ECWRF Chemical System Upgrade\6-CAD\15219 SH39 M-08.dwg 04/29/2024 16:59

CONTROL DIAGRAM SYMBOLS

120V — CONTROL TRANSFORMER, PRIMARY AND SECONDARY VOLTAGES SHOWN, SIZE AS SHOWN OR SPECIFIED

3P 40A — CIRCUIT BREAKER, THERMAL-MAGNETIC, 3 POLE, UON, RATING IN AMPS

DESIGNATES PLC TERMINATIONS

ID — FUSE — MODIFIERS: CLF = CURRENT LIMITING FUSE; DE = DUAL ELEMENT; F = CLASS F

ID / DESCPTN — PUSHBUTTON, MOMENTARY CONTACT, NORMALLY OPEN

ID / DESCPTN — PUSHBUTTON, MOMENTARY CONTACT, NORMALLY CLOSED

ID / DESCPTN — STOP PUSHBUTTON WITH LOCKOUT

2 / CR — CONTROL RELAY OPERATING COIL FUNCTION: CR= CONTROL RELAY; U = UNLATCH; L = LATCH

OL — THERMAL OVERLOAD RELAY

2CR 2CR — OUTPUT CONTACTS

2 / TR — TIMING RELAY OPERATING COIL ON/OFF/DELAY; RANGE: SEC/MIN; SET: SEC/MIN

H O A, X X — SELECTOR SWITCH 3 POSITION MAINTAINED CONTACT (X = CONTACTS CLOSED)

LINE L — INDICATING LIGHT PUSH TO TEST, TEST VOLTAGE TERMINAL SHOWN; L = LENS COLOR; A = AMBER; B = BLUE; G = GREEN; R = RED; W = WHITE

2-WAY SOLENOID VALVE

NORMALLY OPEN	NORMALLY CLOSE	DEFINITION
2TR / TC	2TR / TO	DELAY ON COIL ENERGIZATION (ON DELAY)
		POSITION (LIMIT) SWITCH
		TEMPERATURE SWITCH
		PRESSURE SWITCH
		LEVEL SWITCH

CIRCUITS AND RACEWAYS

RACEWAY EXPOSED

RACEWAY UNDERGROUND U.O.N

RACEWAY CONCEALED IN CONCRETE ENCASEMENT

RACEWAY TURNED TOWARD THE VIEWER

RACEWAY TURNED DOWN

HH23 — HH: HANDHOLE, MH: MANHOLE

J — JUNCTION BOX

TB — TERMINAL BOX

3#10 AWG, GNDG, 1"C — RACEWAY SIZE WITH CONDUCTOR CONTENTS AND SIZES

LPUV-1 — CIRCUIT HOMERUN WITH DESTINATION NOTED

SXXX — SIGNAL/INSTRUMENTATION CONDUIT

CXXX — CONTROL CONDUIT

P-XXX — POWER CONDUIT

LP-2XX — POWER CIRCUIT 240V WITH POWER SOURCE IDENTIFICATION

LP-1XX — POWER CIRCUIT 120V WITH POWER SOURCE IDENTIFICATION

GROUNDING

GROUND ROD WITH GROUND WELL

GROUND CONNECTION, BOLTED TYPE

GROUND CONNECTION, COMPRESSION TYPE

G — GROUNDING CONDUCTOR, MINIMUM #4/0 BARE COPPER

INSTRUMENT CABLE SHIELD GROUND

MOTORS AND EQUIPMENT

DISCONNECT SWITCH, NON-FUSED, HEAVY DUTY PADLOCKABLE, INDUSTRIAL TYPE

M — M = MOTOR; SV = SOLENOID VALVE; 125 = 125HP

FIELD INSTRUMENT

CONTROL STATION (SEE CONTROL DIAGRAMS FOR DEVICES REQUIRED)

TELEPHONE AND COMMUNICATION SYSTEMS: UNLESS OTHERWISE SPECIFIED, TELEPHONE OUTLETS SHALL BE MOUNTED AT SAME HEIGHT AS THE RECEPTACLES, VERIFY.

EXTERNAL LINE OR PLANT PHONE SYSTEM OUTLET

COM. — ETHERNET COMMUNICATION PORT

LIGHTING

FIXTURE IDENTIFICATION:

5 XX 2/40 R 8'-6"

- 5 — NUMBER OF FIXTURES (SHOWN ONLY WHEN REQUIRED FOR CLARITY)
- XX — FIXTURE TYPE REFER TO FIXTURE SCHEDULE TYPE APPLIES TO ALL FIXTURES OF THE SAME SHAPE WITHIN A ROOM OR AREA.
- R — MOUNTING: CEILING (C), RECESSED (R) POLE (PP), STANCHION (S), PENDANT (P), WALL (W).
- 8'-6" — MOUNTING HEIGHT, FLOOR TO BOTTOM OF FIXTURE UON. AS HIGH AS POSSIBLE (AHAP)
- 2/40 — NUMBER OF LAMPS/LAMP WATTAGE

LIGHTING FIXTURE SHAPES AND SCALE ARE REPRESENTED WHERE POSSIBLE. THE EXAMPLES SHOWN BELOW ARE TYPICAL APPLICATIONS.

FLUORESCENT FIXTURE

WALL MOUNTED FIXTURE

EMERGENCY LIGHTING UNIT (SELF-CONTAINED)

MISCELLANEOUS

GROUND CONNECTION

PROGRAMMABLE LOGIC CONTROLLER I/0

E150 TYP — TYPICAL DETAIL DESIGNATION

T — THERMOSTAT

5 — NOTE DESIGNATION

DESIGNATES EQUIPMENT OR DEVICE LOCATED AT LOAD IN THE FIELD

DESIGNATES EQUIPMENT OR DEVICES LOCATED IN MCC

DESIGNATES PLC WIRING TERMINAL

PHOTO ELECTRIC FIRE DETECTOR

IONIZATION SMOKE DETECTOR

REMOVABLE POST

E — END-OF-LINE DEVICE

F — FIRE ALARM PULL STATION

F — COMBINATION STROBE LIGHT/HORN

A — REFERENCE DESIGNATION WITH DRAWING NUMBER WHERE DETAIL IS SHOWN

SURGE SUPPRESSOR

K — KIRK-KEY INTERLOCK

NEMA 4X — CORROSIVE AREA

NEMA 12 — GENERAL PURPOSE AREA

DENOTES DEMOLITION

WIRING DEVICES

SWITCHES: UNLESS OTHERWISE SPECIFIED, ALL SWITCHES ARE WALL MOUNTED

$ — TOGGLE SWITCH, SINGLE POLE, 20 AMP

$ $ — GANGED SWITCHES IN COMMON BOX WITH COMMON WALL PLATE

A $ 3 — SUPERSCRIPT INDICATES CIRCUIT CONTROLLED: a, b, c, ETC. MAY BE COMBINED WITH CIRCUIT NUMBER: 1a, 4b, ETC.

SUBSCRIPT MODIFIER INDICATES:
2 = DOUBLE POLE
3 = THREE WAY
4 = FOUR WAY
K = KEY OPERATED
MC = MOMENTARY CONTACT, THREE POSITION
MS = MANUAL (MOTOR) STARTER OR SWITCH
R = RHEOSTAT (DIMMER, SPEED CONTROL)
WP = WEATHER PROOF AND GFI

RECEPTACLES: UNLESS OTHERWISE SPECIFIED, ALL RECEPTACLES ARE 125 VOLT, SINGLE PHASE, STRAIGHT BLADE, NON LOCKING, GROUNDING STYLE.

DUPLEX RECEPTACLE, 20 AMP, 3 WIRE.
MODIFIERS:
WP = WEATHER PROOF AND GFI
GFI = GROUND FAULT CIRCUIT INTERRUPTER
H = HAZARDOUS AREA-EXPLOSION PROOF

SPECIAL RECEPTACLE

TWIST LOCK RECEPTACLE

STANDARD ABBREVIATIONS

A	AMMETER
AFF	ABOVE FINISHED FLOOR
ATS	AUTOMATIC TRANSFER SWITCH
BCW	BARE COPPER WIRE
C	CONDUIT
C.O.	CONDUIT ONLY (EMPTY CONDUIT)
CP	CONTROL PANEL
CPT	CONTROL POWER TRANSFORMER
CR	CONTROL RELAY
CT	CONTACTOR (HEAVY DUTY)
CU	COPPER
DPDT	DOUBLE POLE DOUBLE THROW
(E) OR EXIST.	EXISTING
FLA	FULL LOAD AMPERE
FM	FIBER OPTIC MODEM
FS	FLOAT SWITCH
FVNV	FULL VOLTAGE NON-REVERSING STARTER
G	GROUND
HP	HORSE POWER
HZ	HERTZ
KVAR	REACTIVE POWER
KW	KILOWATT
KWHR	KILOWATT HOUR
I/O	INPUT/OUTPUT
ISR	INTRINSICALLY SAFE RELAY
LC	LOAD CENTER
LOS	LOCKOUT STOP
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CIRCUIT PROTECTOR
MF	MULTI-FUNCTION METER
MIN	MINIMUM
NC	NORMALLY CLOSED
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
OIT	OPERATOR INTERFACE TERMINAL
PAIR OR PR	TWISTED, SHIELDED PAIRS
PB	PULL BOX
PLC	PROGRAMMABLE LOGIC CONTROLLER
PP	POWER POLE
PPB	POWER PULL BOX
PTT	PUSH-TO-TEST
RTD	RESISTANCE THERMAL DETECTOR
RTU	REMOTE TERMINAL UNIT
SCADA	SUPERVISORY CONTROL & DATA ACQUISITION
SPB	SIGNAL PULL BOX
SPD	SURGE PROTECTION DEVICE
SSRS	SOLID STATE REDUCED VOLTAGE STARTER
SPDT	SINGLE POLE DOUBLE THROW
SWGR	SWITCHGEAR
TDR	TIME DELAY RELAY
TS	TEMPERATURE SWITCH
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
UPS	UNINTERRUPTIBLE POWER SUPPLY
V	VOLTMETER
VFD	VARIABLE FREQUENCY DRIVE
WEPS	WETLANDS PUMP STATION
WP	WEATHER PROOF (NEMA 4X)
XFMR	TRANSFORMER

ONE-LINE DIAGRAM SYMBOLS

2 — SIZE 2 COMBINATION FULL VOLTAGE NON-REVERSING MAGNETIC STARTER MCP SIZED BY MANUFACTURER (OVERLOAD RELAY NOT SHOWN).
RV = REDUCED VOLTAGE
2S2W = TWO-SPEED TWO-WINDING
2 = SIZE 2

MPD 413 — DESIGNATE NAME AND CIRCUIT NUMBER OF 480V POWER CIRCUIT

3 400/3 — CURRENT TRANSFORMER WITH RATIO AND NUMBER OF UNITS

200A — DISCONNECT 200 AMP SHOWN

MAIN SERVICE METER (BY UTILITY COMPANY)

FU — FUSE WITH BLOWN INDICATOR

MF — MULTI-FUNCTION ELECTRONIC METER

480/277V, 5.75% Z — POWER TRANSFORMER; IMPEDANCE SHOWN

REACTOR (3%)

480V 3Ø, 4W, 600KW 60HZ — GENERATOR. POWER RATING, FREQUENCY, VOLTAGE.

GENERAL NOTES

1. THIS DRAWING IS GENERAL IN NATURE. SOME SYMBOLS SHOWN HERE ON MAY NOT BE USED ON THE CONTRACT DRAWINGS.
2. IDENTIFICATIONS (ID), SIZES, RATINGS, LOCATIONS AND SIMILAR INFORMATION SHOWN ASSOCIATED WITH SYMBOLS ARE OPTIONAL; EXAMPLES OF SUCH INFORMATION ARE SHOWN WITH SOME SYMBOLS FOR CLARITY.
3. THE ELECTRICAL DRAWINGS USE THE ONE-LINE DIAGRAMS AND PANEL SCHEDULES IN CONJUNCTION WITH SHOWING THE LOCATION OF THE ELECTRICAL/INSTRUMENTATION SOURCES AND LOADS/DEVICES SHOWN ON THE PLAN DRAWINGS TO DEPICT THE WORK. THE CONTRACTOR SHALL USE THESE DOCUMENTS TO DETERMINE AND PROVIDE THE NECESSARY RACEWAY AND WIRING SYSTEM FOR EACH CIRCUIT. ALL INDOOR RACEWAY SHALL BE RUN EXPOSED, AND ROUTED BY THE CONTRACTOR, UNLESS OTHERWISE NOTED. THE TYPE OF RACEWAY AND WIRE USED SHALL BE AS SPECIFIED IN THE SPECIFICATIONS UNLESS OTHERWISE NOTED.
4. THE LOCATION OF THE CONTROL STATIONS SHOWN ON THE PLAN DRAWINGS ARE DIAGRAMMATIC AND THE ACTUAL LOCATION SHALL BE COORDINATED IN THE FIELD WITH THE CONSTRUCTION MANAGER.
5. THE EXACT LOCATION OF THE MOTORS AND ACCESSORIES ARE NOT SHOWN. THE CONTRACTOR SHALL COORDINATE THE STRUCTURAL AND MECHANICAL DRAWINGS FOR CONDUIT STUBOUT AND TERMINATION LOCATIONS.
6. ALL EQUIPMENT SHALL BE LABELED WITH NAMEPLATES. DESCRIPTION OF EQUIPMENT SHALL BE IN ACCORDANCE WITH THE ONE-LINE DIAGRAM DESCRIPTION. A LIST OF THE NAMEPLATES SHALL BE SUBMITTED TO THE CONSTRUCTION MANAGER PRIOR TO ENGRAVING.
7. UNLESS OTHERWISE NOTED, ALL CONVENIENCE OUTLETS SHALL BE MOUNTED AT 48-INCHES ABOVE FINISHED FLOOR. ALL LIGHT SWITCHES SHALL BE MOUNTED AT 54-INCHES ABOVE FINISHED FLOOR.
8. EACH CONVENIENCE OUTLET AND LIGHTING CIRCUIT SHALL BE PROVIDED WITH A #12AWG GREEN GROUNDING CONDUCTOR.
9. THE CONTRACTOR SHALL INCLUDE IN HIS BID THE COST TO DISCONNECT AND REMOVE EXISTING ELECTRICAL EQUIPMENT AS SHOWN ON THE DRAWINGS.
10. ALL TYPICAL DETAILS SHALL APPLY REGARDLESS THEY ARE REFERENCED ON ANY DRAWING OR NOT.
11. FOR PACKAGED EQUIPMENT, CONTRACTOR SHALL FOLLOW THE MANUFACTURER'S RECOMMENDED INSTALLATION AND SHALL INSTALL THEM PER APPROVED SHOP DRAWINGS.
12. FOR CLARITY, CONTROL SCHEMATIC DIAGRAMS DO NOT SHOW REQUIRED EQUIPMENT GROUNDING CONDUCTOR WHICH SHALL BE PROVIDED FOR EACH POWER CIRCUIT.
13. ALL EXPOSED CONDUITS SHALL BE PVC-COATED RIGID GALVANIZED STEEL CONDUITS, ALL ASSOCIATED CONDUIT ACCESSORIES SUCH AS FITTINGS, BOXES, CONDUITS ETC. SHALL ALSO BE 316 STAINLESS STEEL.
14. THE PROJECT AREA CURRENTLY HAS EXISTING UNDERGROUND UTILITIES SUCH AS WATER PIPING, ELECTRICAL CONDUITS/DUCBANKS, ETC. ALL OF WHICH SHALL BE FIELD VERIFIED PRIOR TO ANY TRENCHING TO AVOID DAMAGES TO THESE EXISTING UNDERGROUND UTILITIES.
15. ALL EQUIPMENT AND ASSOCIATED INSTALLATION IN NEMA 4X AREAS SHALL BE CORROSIVE RESISTANT WITH STAINLESS STEEL MATERIALS AND ENCLOSURES.
16. GENERIC ARC FLASH WARNING LABELS SHALL BE PROVIDED FOR EACH OF THE ELECTRICAL EQUIPMENT, PANEL, ENCLOSURE. SPECIFIC ARC FLASH LABELS WILL BE PROVIDED BY THE CITY FROM UPDATED PREVIOUS STUDY.
17. CONTRACTOR SHALL SUBMIT A CONDUIT LAYOUT FOR THE SITE AND A CONDUIT LAYOUT FOR THE TANK AREA FOR REVIEW AND APPROVAL PRIOR TO EXECUTION OF THE WORK.
18. FOR 120VAC CIRCUITS, NO SHARED NEUTRALS ARE ALLOWED.
19. IN THIS PROJECT, CONTRACTOR SHALL SALVAGE AND RETURN TO THE CITY:
    A. ALL LIGHT FIXTURES THAT ARE REPLACED WITH NEW UNITS
    B. ALL MAGMETERS AND TRANSMITTERS THAT ARE REPLACED WITH NEW UNITS. STORE PROPERLY AT DESIGNATED AREA AS DIRECTED BY THE CITY.

ENGINEERS, INC.
Oakland, San Francisco, Orange County, CA

DATE: 04/30/2024
DESIGNED BY: DTN
DRAWN BY: TP
CHECKED BY: DN

PROJECT NO.
C66501840



CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

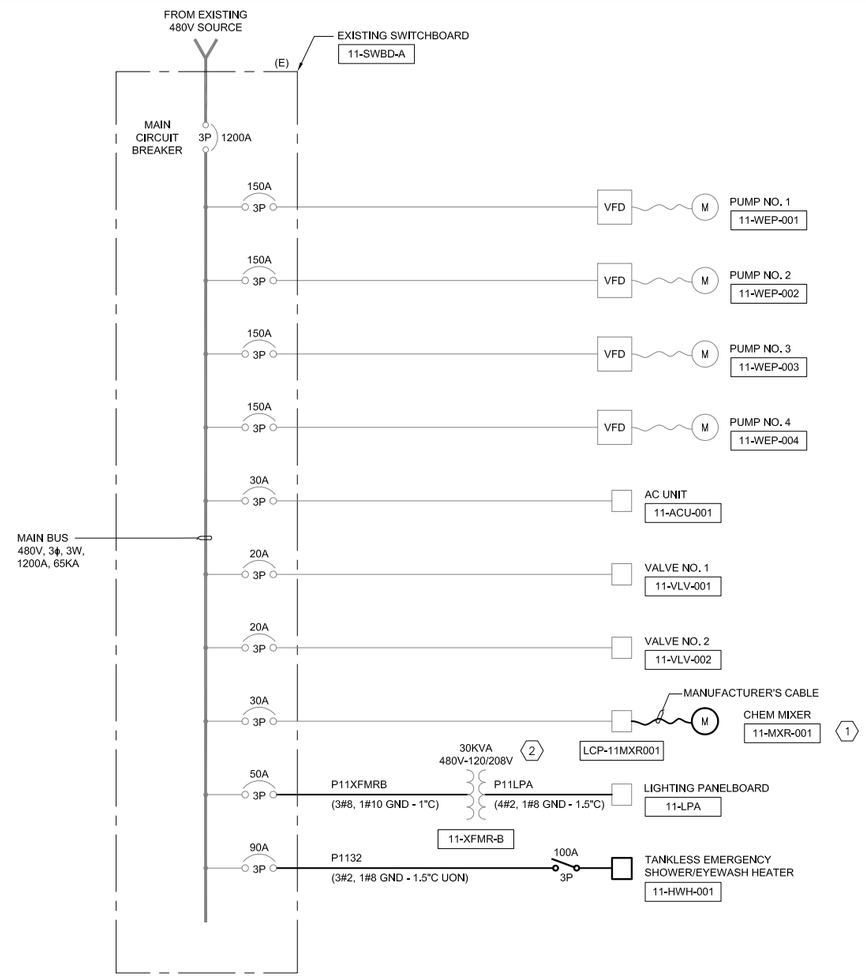
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
ELECTRICAL
LEGEND AND NOTES

SHEET
E-1

40 OF 55

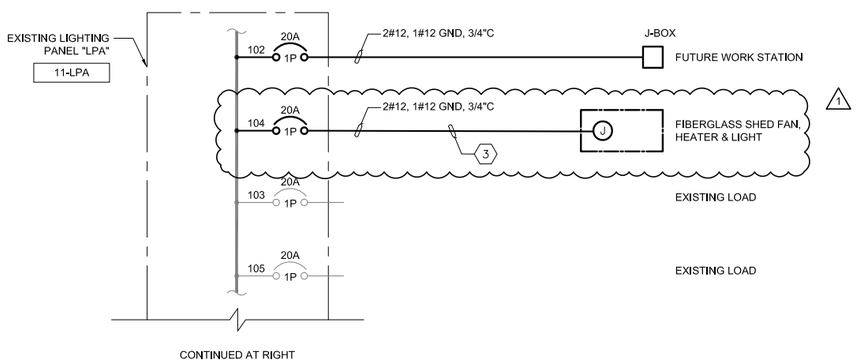
34"x22" ORIGINAL SCALE IN INCHES 0 1 2

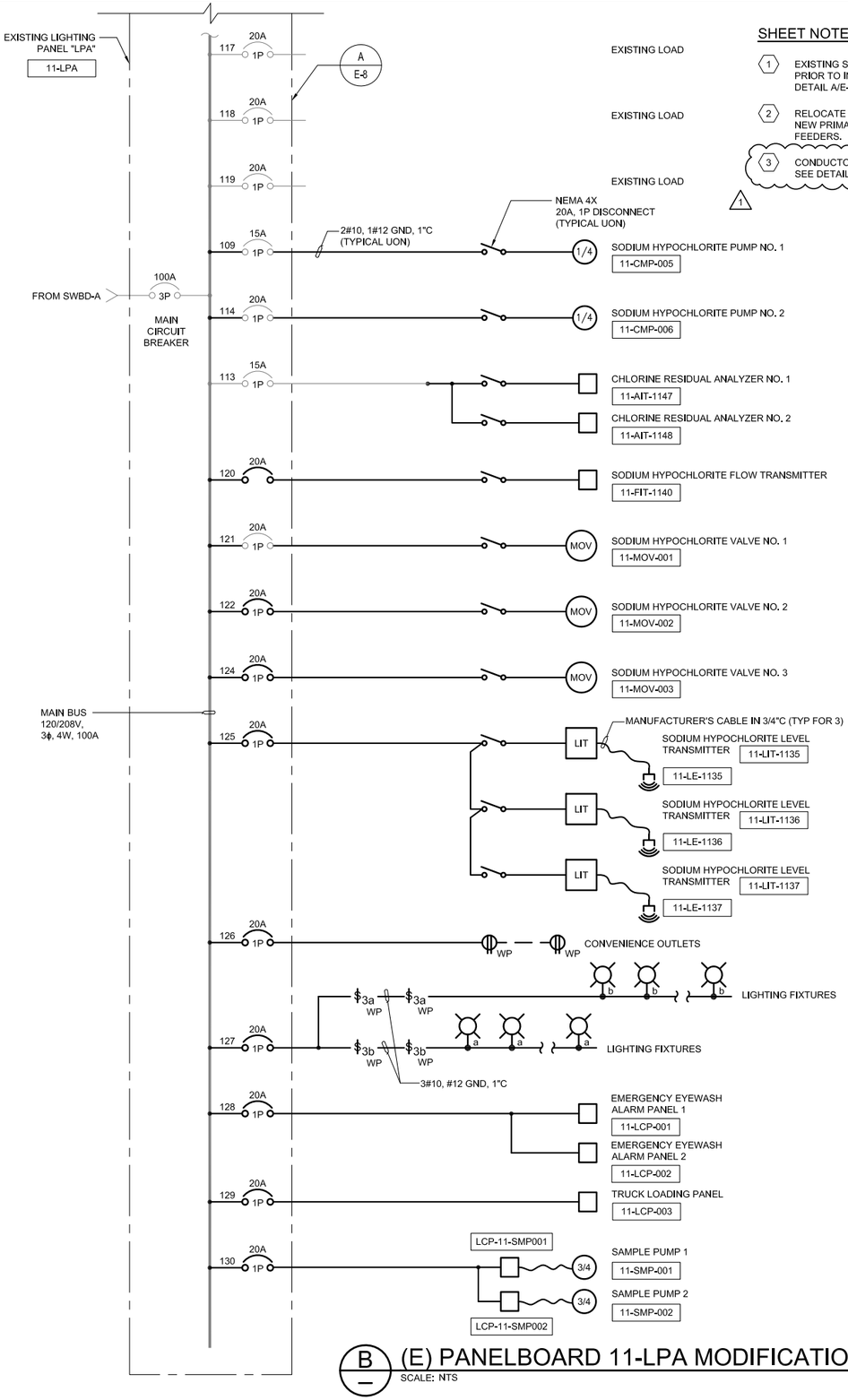
P:\482_Petaluma Chemical System Upgrade_Dudek\DRAWINGS\482_E01.dwg 04/30/2024 13:46



A WEPS MAIN SINGLE-LINE DIAGRAM

SCALE: NTS





B (E) PANELBOARD 11-LPA MODIFICATIONS

SCALE: NTS

SHEET NOTES:

1. EXISTING SUBMERSIBLE MIXER SHALL BE DISCONNECTED AND REMOVED PRIOR TO INSTALLATION AND CONNECTION OF THE NEW MIXER. SEE DETAIL A/E-10 FOR LOCATION. SEE SPECS FOR PHASING REQUIREMENTS.
2. RELOCATE TRANSFORMER AS PER DETAIL F/E-7. FURNISH AND INSTALL NEW PRIMARY AND SECONDARY FEEDERS AFTER REMOVAL OF EXISTING FEEDERS.
3. CONDUCTORS ARE INSTALLED IN NEW AND EXISTING CONDUIT SEGMENTS. SEE DETAIL A/E-10.

ADDENDUM 1 7/2/2024

ENGINEERS, INC.
Civil, Geotechnical, Water Resources, Energy, Surveying
DATE: 04/30/2024
DESIGNED BY: DTN
DRAWN BY: TP
CHECKED BY: DN

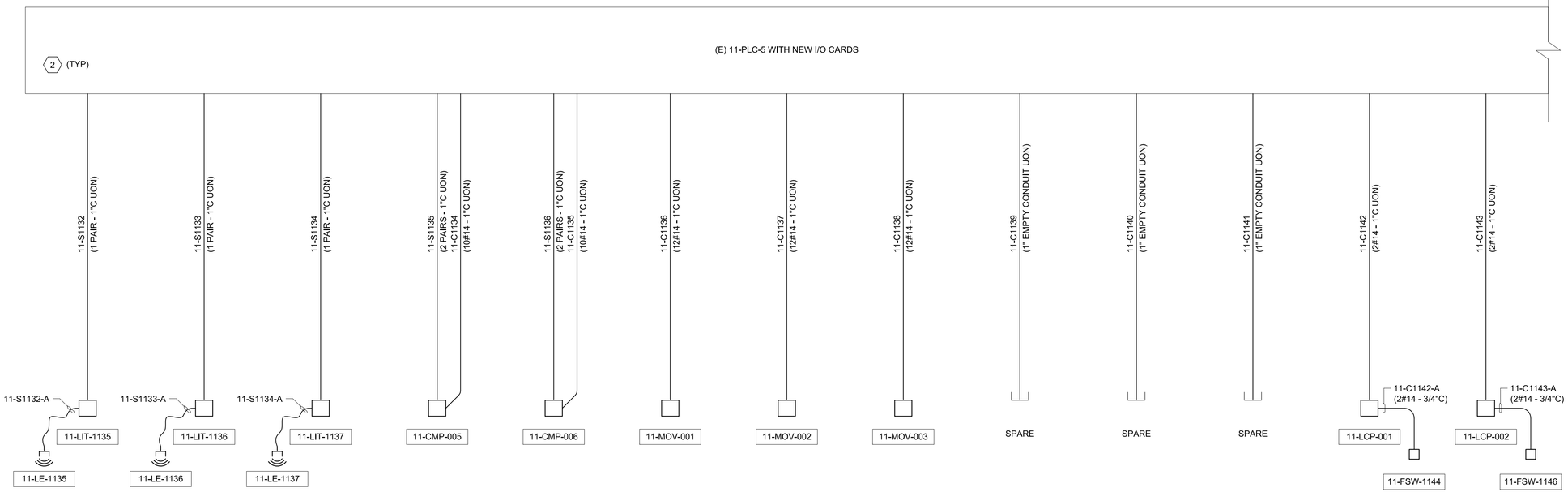
PROJECT NO. C66501840

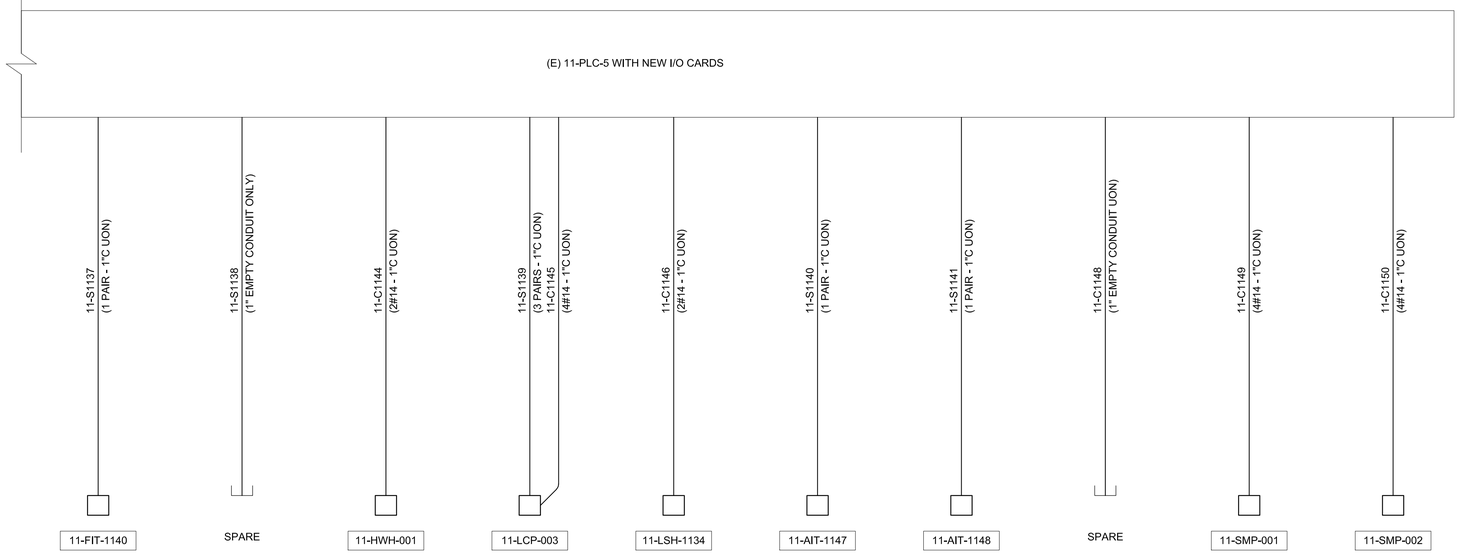
CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

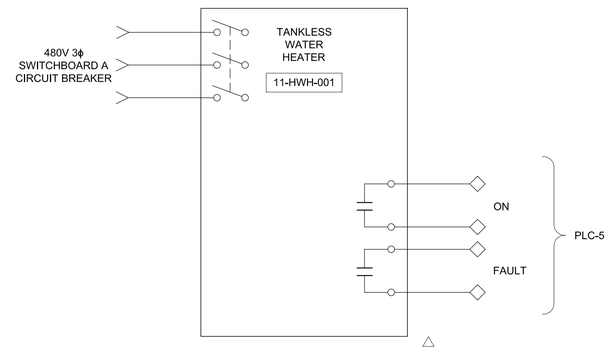
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
ELECTRICAL
SINGLE-LINE DIAGRAMS

SHEET E-2

41 OF 55







A CONTROL ONE-LINE DIAGRAM (1)(3)

SCALE: NTS

B TEPID WATER HEATER

SCALE: NTS

SHEET NOTES:

1. SEE DETAILS B/E-8 AND C/E-8 FOR LOCATIONS WHERE SIGNAL CIRCUITS ARE INSTALLED IN A COMMON, COMBINED CONDUIT. SIMILARLY, SEE DETAILS B/E-8 AND C/E-8 FOR LOCATIONS WHERE POWER AND CONTROL CIRCUITS ARE INSTALLED IN A COMMON, COMBINED CONDUIT.
2. COMPLETE SIGNAL CONNECTIONS TO NEW I/O CARDS ARE REQUIRED. SEE DETAILS C/E-6 AND D/E-6.
3. LOOP DIAGRAMS AND INTERCONNECTION DIAGRAMS ARE REQUIRED. SEE SPECS DIV13.

DIN ENGINEERS, INC.
Oakland, San Francisco, Orange County, CA

DATE: 04/30/2024
DESIGNED BY: DTN
DRAWN BY: TP
CHECKED BY: DN

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
DIEP TAN NGUYEN
No. E-18087
EXP. 6/30/25
ELECTRICAL
STATE OF CALIFORNIA
6/30/24

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
ELECTRICAL
CONTROL ONE LINE DIAGRAM

SHEET
E-3

42 OF 55

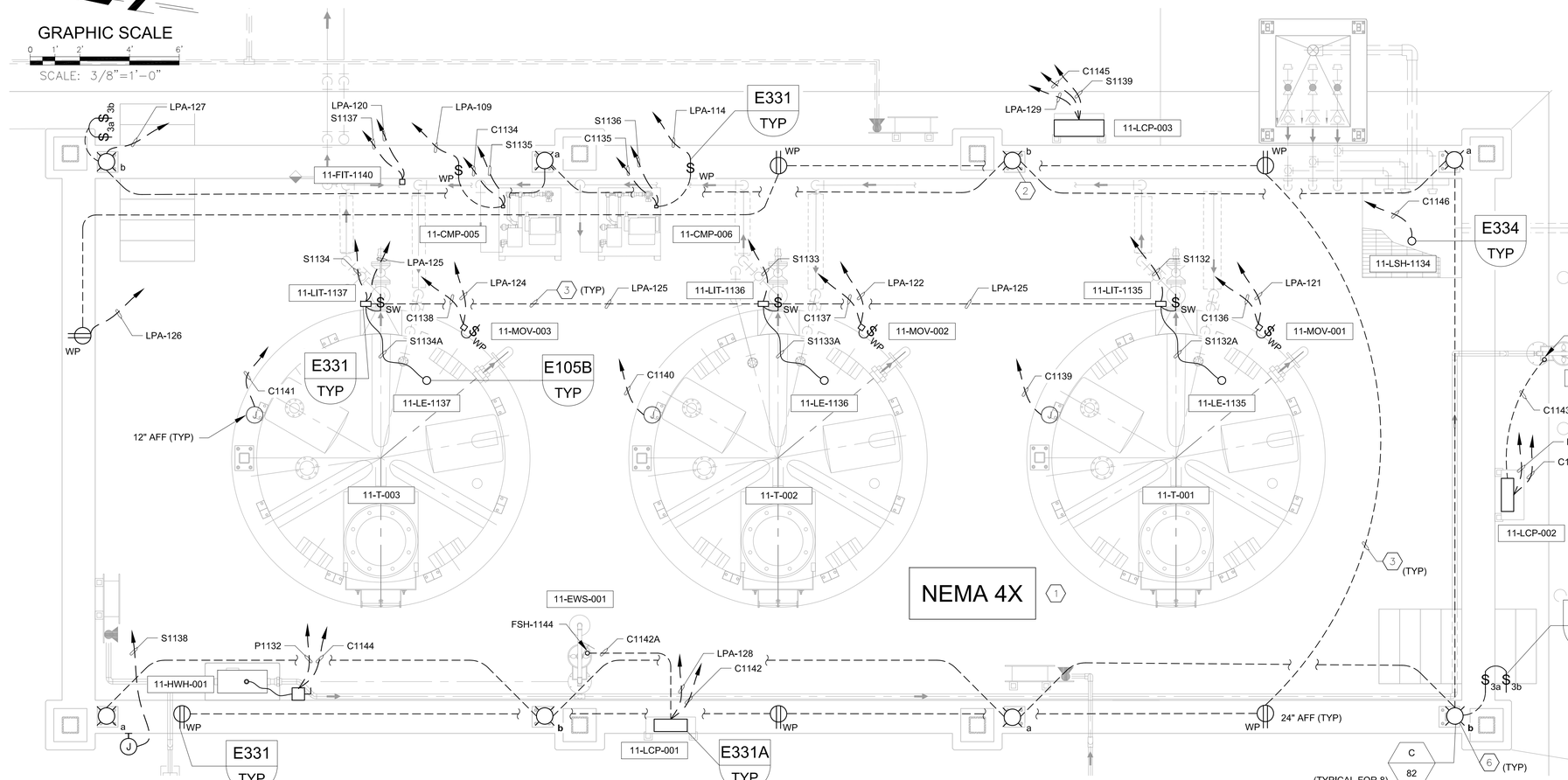
34"x22" ORIGINAL SCALE IN INCHES 0 1 2

P:\482_Petaluma Chemical System Upgrade_Dudek\DRAWINGs\482_E03.dwg 04/30/2024 13:47

GRAPHIC SCALE

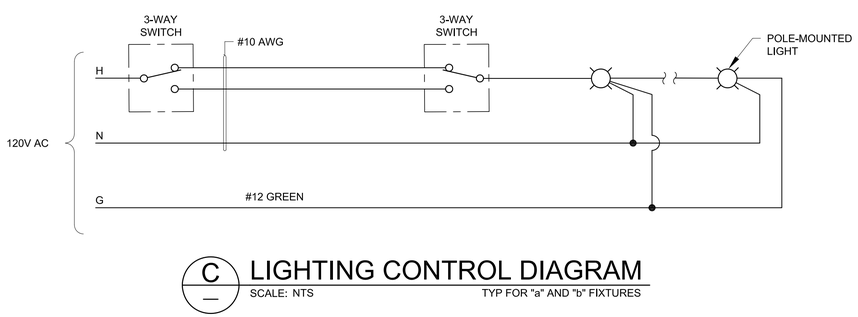
0 1' 2' 4' 6'

SCALE: 3/8"=1'-0"



A PUMP STATION CHEMICAL AREA PLAN 1 4

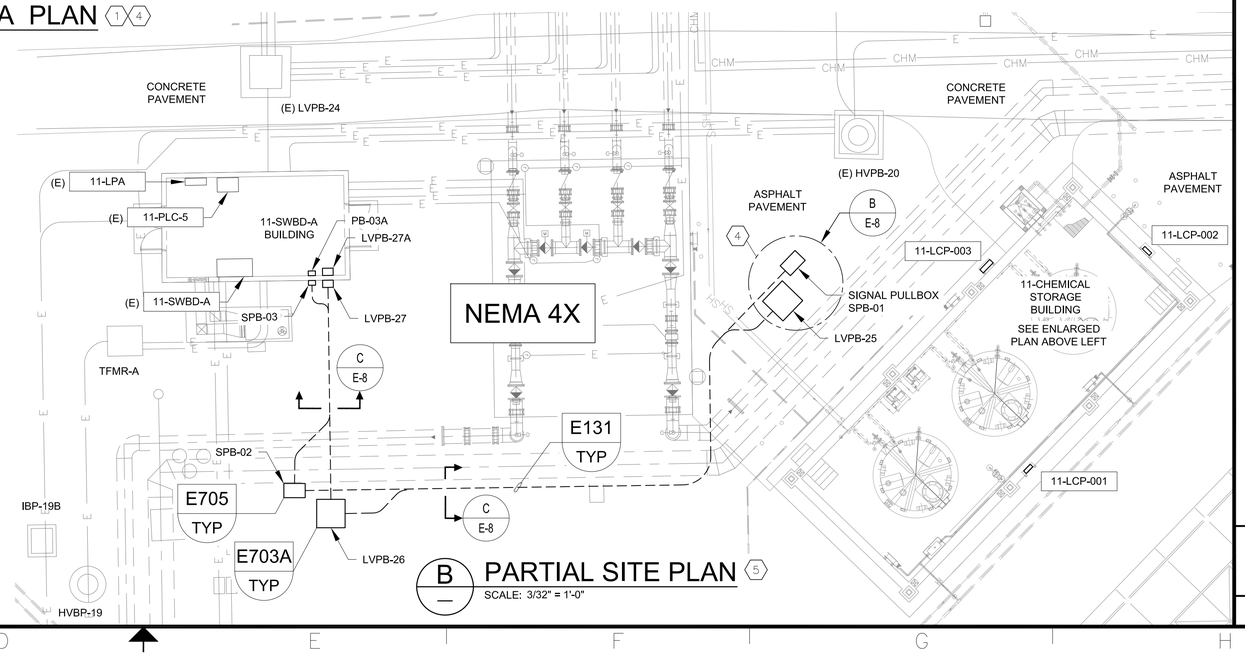
SCALE: 3/8" - 1'-0"



C LIGHTING CONTROL DIAGRAM

SCALE: NTS

TYP FOR "a" AND "b" FIXTURES



B PARTIAL SITE PLAN 5

SCALE: 3/32" = 1'-0"

SHEET NOTES:

1. THIS AREA IS DESIGNATED AS NEMA 4X AREA. ALL ENCLOSURES IN THIS AREA SHALL BE RATED NEMA 4X. ALL EQUIPMENT AS WELL AS THEIR INSTALLATION SHALL BE SUITABLE FOR A WET AND CORROSIVE ENVIRONMENT. SEE GENERAL NOTES 13 AND 15.
2. CONDUIT FOR LIGHT FIXTURE SHALL BE EMBEDDED IN CONCRETE. FIXTURE SHALL BE MOUNTED AT APPROXIMATELY 15' FROM THE BASE OF POLE.
3. DESIGNATES CONDUIT EMBEDDED IN CONCRETE FLOOR SLAB FOR EQUIPMENT AND DEVICES LOCATED ON THE FLOOR SLAB. FOR EQUIPMENT AND DEVICES LOCATED OUTSIDE THE CHEMICAL AREA, CONDUITS SHALL BE DIRECT BURIED AS PER TYPICAL DETAIL E131/TYP.
4. ALL ELECTRICAL POWER AND CONTROL CONDUITS SHALL BE ROUTED THROUGH PULL BOX LVPB-25.

   ALL SIGNAL CONDUITS SHALL BE ROUTED THROUGH PULL BOX SPB-01.
5. SEE DRAWING M-2 FOR ALL KNOWN EXISTING UNDERGROUND SITE UTILITIES LOCATED IN THIS AREA.
6. POLE MOUNTED LED LIGHT FIXTURE MOUNTED ON CONTAINMENT WALL. SEE STRUCTURAL DRAWINGS (DETAIL 3/S-11) FOR POLE MOUNTING DETAILS.

DTN ENGINEERS, INC.
Oakland, San Francisco, Orange County, CA

DATE: 04/30/2024
DESIGNED BY: DTN
DRAWN BY: TP
CHECKED BY: DN

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
DIEP TAN NGUYEN
No. E-18031
Exp. 6/30/25
ELECTRICAL
STATE OF CALIFORNIA
6/30/24

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

GRAPHIC SCALE

0 4' 8' 16' 24'

SCALE: 3/32"=1'-0"

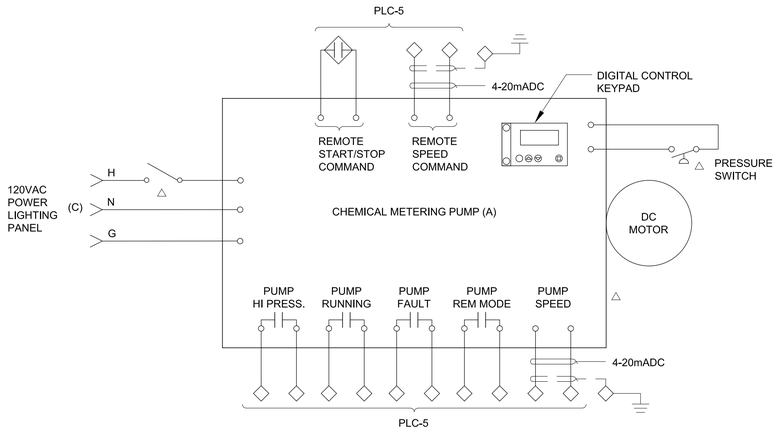
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
ELECTRICAL
PUMP STATION CHEMICAL AREA PLAN

SHEET
E-4

43 OF 55

34"x22" ORIGINAL SCALE IN INCHES 0 1 2

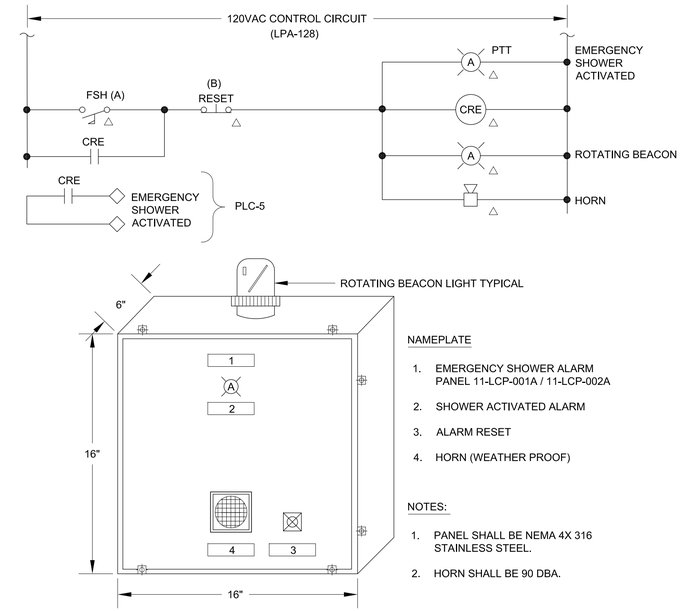
P:\482_Petaluma Chemical System Upgrade_Dudek\DRAWINGs\482_E04.dwg 04/30/2024 13:47



A — METERING PUMP CONTROL DIAGRAM

SCALE: NTS

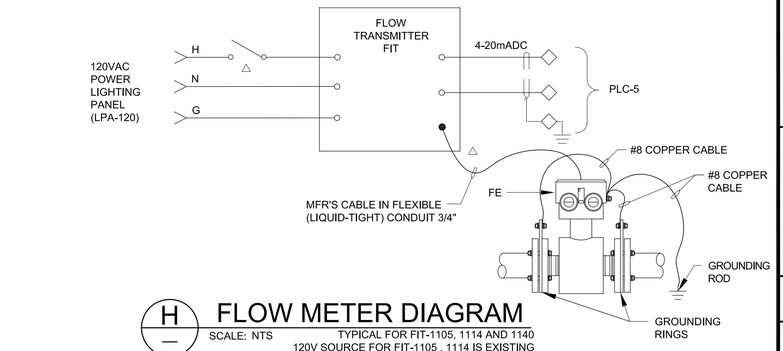
TYPICAL FOR 11-CMP-005 AND 11-CMP-006



B — EMERGENCY EYEWASH CONTROL DIAGRAM

SCALE: NTS

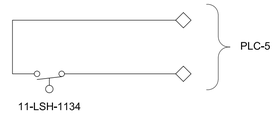
TYPICAL FOR 11-EWS-001/11-LCP-001 AND 11-EWS-002/11-LCP-002



H — FLOW METER DIAGRAM

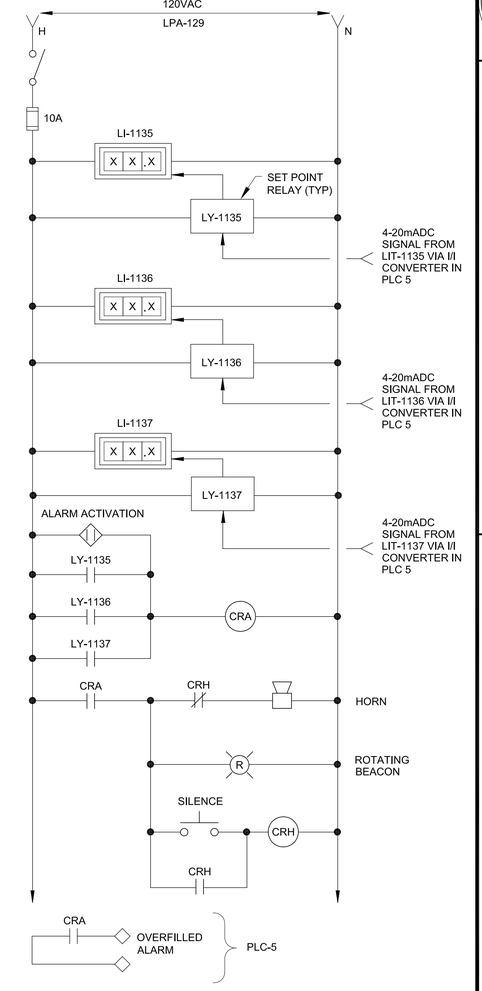
SCALE: NTS

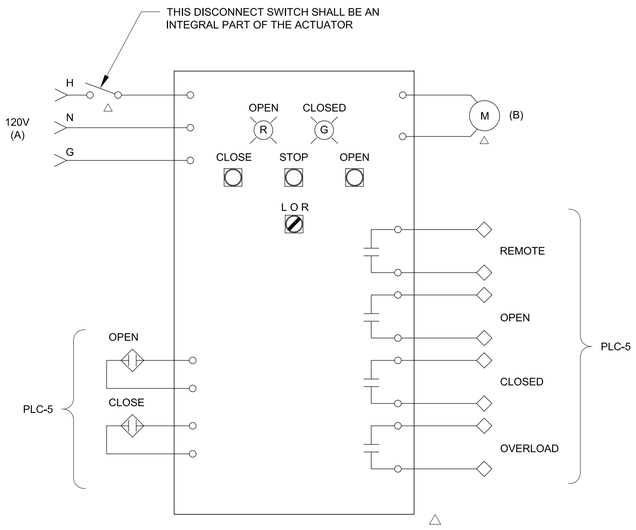
TYPICAL FOR FIT-1105, 1114 AND 1140
120V SOURCE FOR FIT-1105 , 1114 IS EXISTING



I — SUMP FLOAT

SCALE: NTS



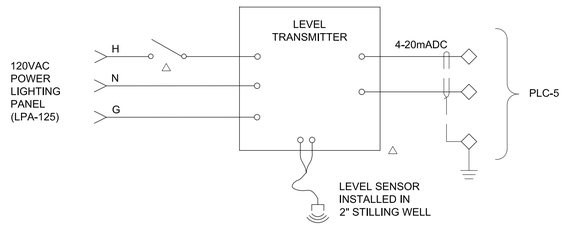


(A)	(B)
LPA-121	MOV-001
LPA-122	MOV-002
LPA-124	MOV-003

C — MOV CONTROL DIAGRAM

SCALE: NTS

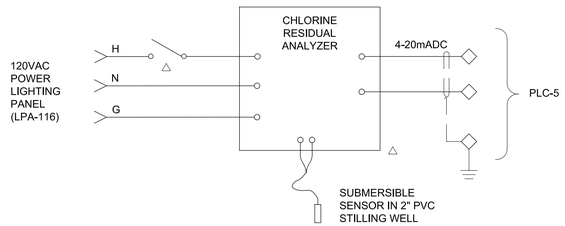
TYPICAL FOR 11-MOV-001, 11-MOV-002 AND 11-MOV-003



D — ULTRASONIC LEVEL TRANSMITTER

SCALE: NTS

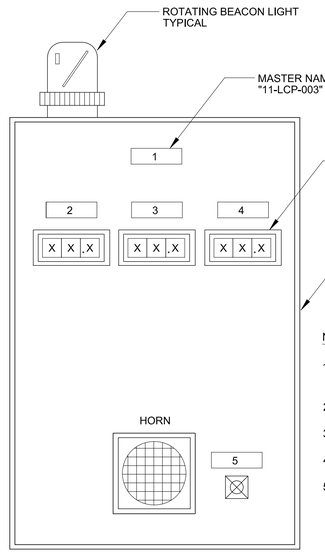
TYPICAL FOR LIT-1135, LIT-1136 AND LIT-1137



E — TOTAL CL2 ANALYZER

SCALE: NTS

TYPICAL FOR AIT-1147 AND AIT-1148



F — TRUCK LOADING STATION 11-LCP-003

SCALE: NTS

G — SODIUM HYPOCHLORITE TRUCK LOADING PANEL 11-LCP-003 - ALARM SCHEMATIC

SCALE: NTS

ENGINEERS, INC.
Oakland, San Francisco, Orange County, CA

DATE: 04/30/2024
DESIGNED BY: DTN
DRAWN BY: TP
CHECKED BY: DN

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
DIEP TAN NGUYEN
No. E-18837
EXP. 6/30/25
ELECTRICAL
STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
ELECTRICAL
CONTROL SCHEMATIC DIAGRAMS

SHEET
E-5

44 OF 55

34"x22" ORIGINAL SCALE IN INCHES 0 1 2

P:\482_Petaluma Chemical System Upgrade_Dudek\DRAWINGs\482_E05.dwg 04/30/2024 13:48



A — (E) SWITCHBOARD "A" (1)
SCALE: NTS



B — (E) PANELBOARD "11-LPA"
SCALE: NTS



D — (E) 11-PLC-5 BACK PAN (4)
SCALE: NTS

SHEET NOTES:

1. REMOVE "SPARE" NAMEPLATE OF EXISTING 90A 3P BREAKER AND REPLACE IT WITH NEW NAMEPLATE

   " HOT WATER HEATER
   11-HWH-001 "

2. ADD NEW CIRCUIT BREAKERS AND REVISE CIRCUIT DIRECTORY FOR THIS PANELBOARD AS PER DETAIL A/E-8.

3. FURNISH AND INSTALL NEW I/O CARDS AS SHOWN IN THE AVAILABLE SLOTS AS FOLLOWS:

   - ONE MODICON 8PT ANALOG INPUT CARD - RACK 01 SLOT 7
   - ONE MODICON DIGITAL OUTPUT CARD - RACK 01 SLOT 15
   - TWO MODICON 16PT DIGITAL INPUT CARDS - RACK 01 SLOTS 12, 13

   SEE SPECS FOR ADDITIONAL DETAILS.

4. FIELD MODIFY EXISTING PANEL TO ACCOMMODATE COMPLETE WIRINGS FOR CONTROL AND MONITORING OF NEW EQUIPMENT AS SHOWN ON THE P&ID DRAWING I-2. ALL WORK IN THIS PANEL SHALL CONFORM TO REQUIREMENTS SET FORTH BY UL508A STANDARDS.

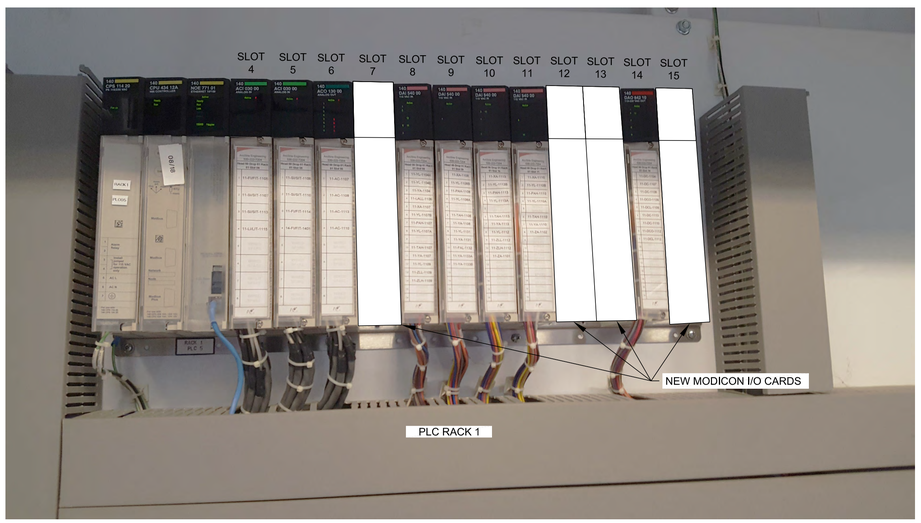
5. NEW TERMINAL STRIPS AND RELAYS SHALL BE PROVIDED TO EXISTING DIN RAILS WITH CONTINUED NUMBERS. FOR EXAMPLES:

   a) FOR TB2, FOR ANALOG CIRCUITS, NEW NUMBER SHALL START WITH 17.
   b) FOR TB4, FOR DIGITAL CIRCUITS, NEW NUMBER SHALL START WITH 65.
   c) FOR CONTROL DELAYS, NEW RELAY NUMBER SHALL START WITH R-17.

   SHOP DRAWINGS SHALL BE PREPARED FOLLOWING THE ABOVE REQUIREMENTS FOR REVIEW AND APPROVAL.

6. EXISTING SUBMERSIBLE MIXER AND CABLE SHALL BE REMOVED PRIOR INSTALLATION OF THE NEW MIXER. EXISTING MINICAS MODULE SHALL BE REMOVED AND REPLACED WITH NEW UNIT FURNISHED WITH NEW MIXER. REWIRING IS REQUIRED. TEST FOR COMPLETE OPERATIONS.

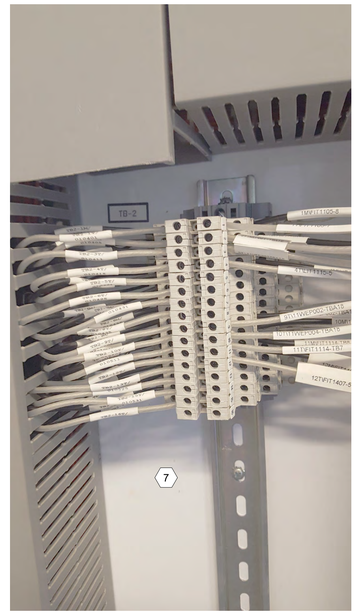
7. THIS PHOTO REPRESENT TYPICAL EXISTING TERMINAL BLOCKS ON THE EXISTING DIN RAIL. NEW TERMINAL BLOCKS SHALL BE ADDED AND INSTALLED IN SIMILAR MANNER TO ACCOMMODATE NEW SIGNALS.



C — (E) 11-PLC-5 CPU (3)
SCALE: NTS



E — (E) SUBMERSIBLE MIXER CONTROL PANEL
SCALE: NTS



F — (E) TERMINAL BLOCKS
SCALE: NTS

DIN ENGINEERS, INC.
Oakland, San Francisco, Orange County, CA

DATE: 04/30/2024
DESIGNED BY: DTN
DRAWN BY: TP
CHECKED BY: DN

PROJECT NO.
C66501840



CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

SODIUM HYPOCHLORITE SYSTEM REPLACEMENT
AND RELOCATION
ELECTRICAL
CONSTRUCTION DETAILS - SHEET 1

SHEET
E-6

45 OF 55

34"x22" ORIGINAL SCALE IN INCHES 0 1 2

P:\482_Petaluma Chemical System Upgrade_Dudek\DRAWINGs\482_E06.dwg 04/30/2024 13:50



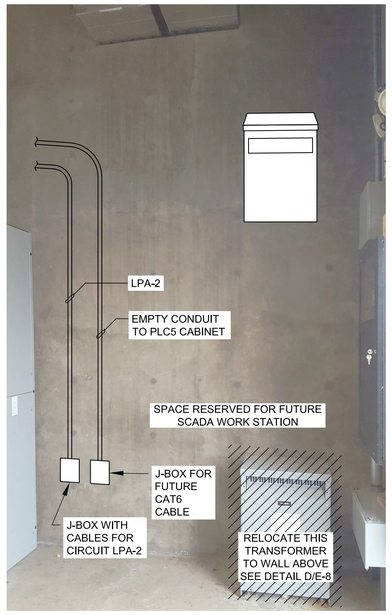
A (E) FLOW METER FIT-1114 REPLACEMENT 1 4

SCALE: NTS



B (E) POLE & LIGHT REPLACEMENT 3 4

SCALE: NTS

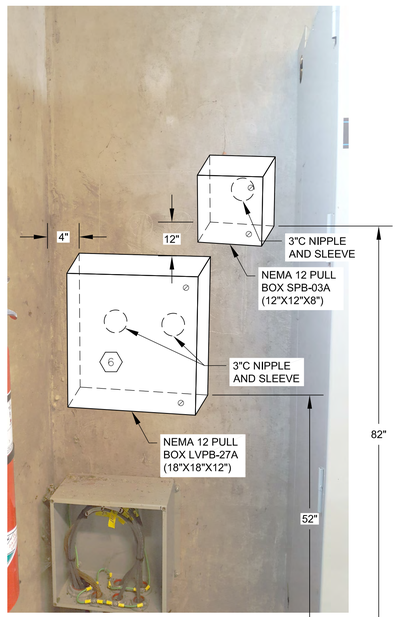


F TRANSFORMER RELOCATION

SCALE: NTS

SHEET NOTES:

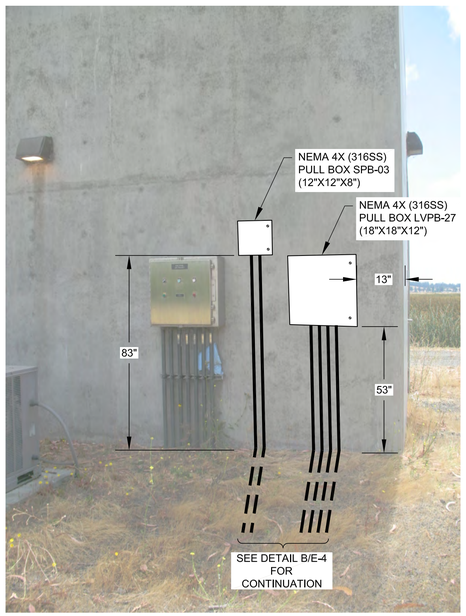
1. THIS EXISTING 14" FLOWMETER AND FLOW TRANSMITTER SHALL BE REMOVED AND REPLACED WITH NEW METER AND TRANSMITTER. SEE DETAIL A/E-11 FOR LOCATION.
2. THIS EXISTING 14" FLOWMETER AND FLOW TRANSMITTER SHALL ALSO BE REMOVED AND REPLACED WITH NEW . SEE DETAIL A/E-11 FOR LOCATION.
3. THIS EXISTING LIGHT POLE WITH A RECEPTACLE AND THE LIGHT FIXTURE SHALL BE REPLACED WITH NEW. THE NEW POLE SHALL MATCH WITH EXISTING BASE PLATE 9.5" SQUARE WITH 4-IN SQUARE 10FT TALL POLE.
4. CONTRACTOR SHALL SALVAGE AND RETURN TO THE CITY AND STORE AT DESIGNATED AREA AS DIRECTED BY THE CITY.
5. EACH OF THE PULL BOX SHALL BE SUPPORTED BY UNITSTRUT CHANNELS (316SS) AND SHALL BE FULLY COORDINATED BEFORE WALL MAY BE CORE DRILLED FOR INSTALLATION OF THE CONDUIT SLEEVES WHICH SHALL BE SEALED.
6. RADAR AND/OR X-RAY MACHINE SHALL BE USED TO IDENTIFY EXISTING REBARS WHICH SHALL BE AVOIDED. SUBMIT FINDING REPORT FOR REVIEW AND APPROVAL PRIOR TO ACTUALLY EXECUTING THE WORK.
7. CONDUIT SLEEVES SHALL BE PVC-COATED RGS. SEAL AROUND CONDUIT WITH CONCRETE SEALING COMPOUND TO MAKE SURE NO WATER CAN ENTER THRU THE OPENINGS.



C CONDUIT ENTRY DETAIL 5 7

SCALE: NTS

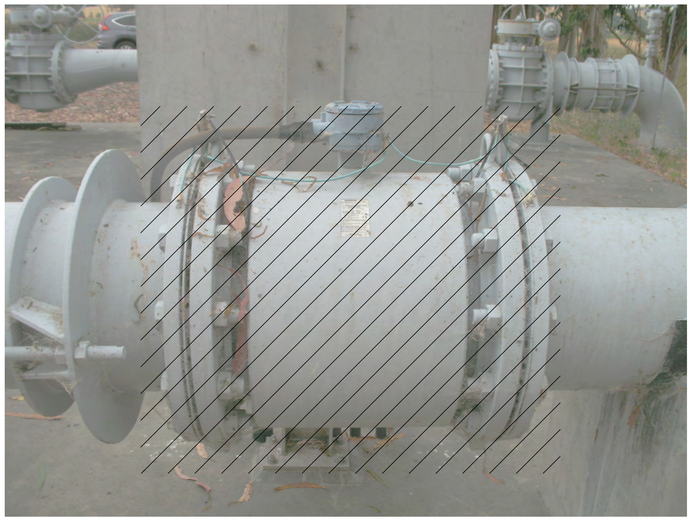
DIMENSIONS ARE APPROXIMATE



D CONDUIT ENTRY DETAIL 5

SCALE: NTS

DIMENSIONS ARE APPROXIMATE



E (E) FLOWMETER FIT-1105 REPLACEMENT 2 4

SCALE: NTS

ENGINEERS, INC.
Oakland, San Francisco, Orange County, CA

DATE: 04/30/2024
DESIGNED BY: DTN
DRAWN BY: TP
CHECKED BY: DN

PROJECT NO.
C66501840



CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

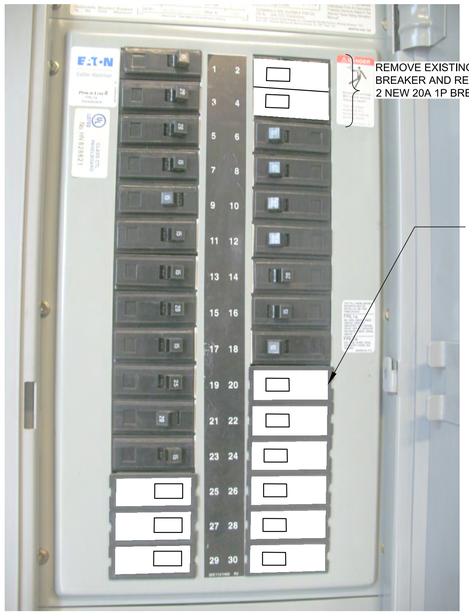
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
ELECTRICAL
CONSTRUCTION DETAILS - SHEET 2

SHEET
E-7

46 OF 55

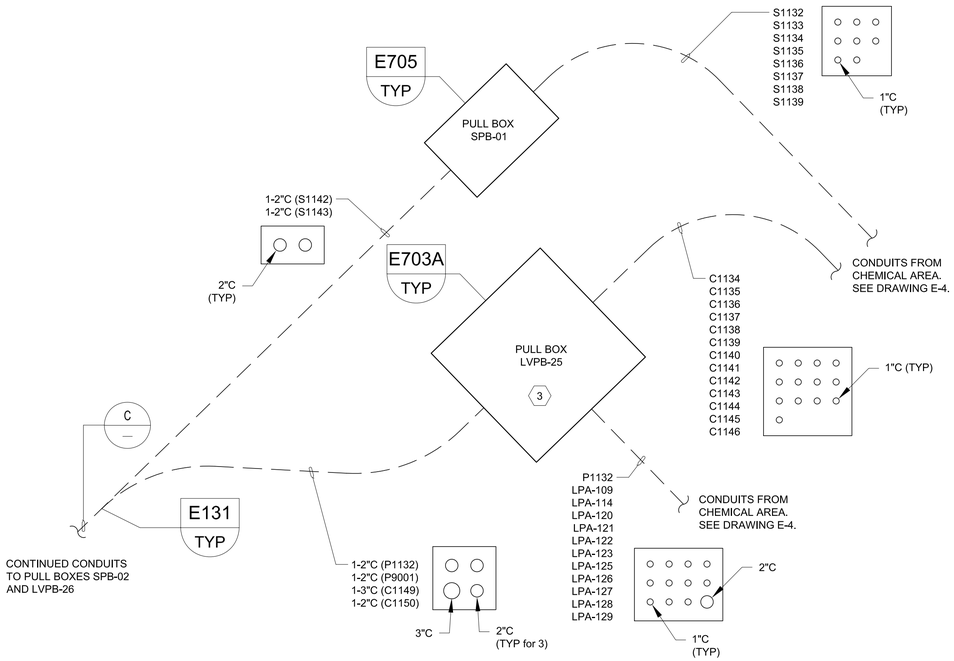
34"x22" ORIGINAL SCALE IN INCHES 0 1 2

P:\482_Petaluma Chemical System Upgrade_Dudek\DRAWINGs\482_E07.dwg 04/30/2024 13:52



A (E) PANEL "LPA" MODIFICATIONS 1

SCALE: NTS

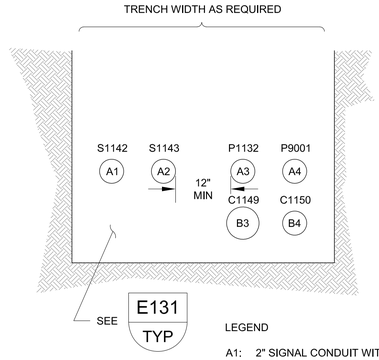


B POWER/CONTROL, SIGNAL CONDUIT CONFIGURATION DIAGRAM

SCALE: NTS

SHEET NOTES:

1. NEW BREAKERS SHALL BE MANUFACTURED BY EATON TO MATCH EXISTING BREAKERS. UPDATE EXISTING CIRCUIT DIRECTORY WITH NEW LOAD DESIGNATIONS AS PER ONE-LINE DIAGRAM SHOWN ON DRAWING E-2.
2. EXTREME CARE SHALL BE PROVIDED IN PULLING MULTIPLE CONDUCTORS IN A CONDUIT TO AVOID DAMAGE TO THE CONDUCTORS.
3. COIL UP AND TAG SPARE CONTROL CONDUCTORS "SPARE CONDUCTORS TO PLC 5".



LEGEND

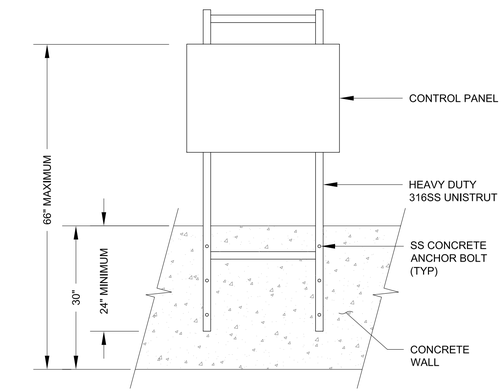
A1: 2" SIGNAL CONDUIT WITH TEN PAIRS
A2: 2" SIGNAL CONDUIT ONLY WITH PULL WIRE

A3: 2" POWER CONDUIT (P1132)
A4: 2" POWER CONDUIT (22#10, 11#12 GND FOR ALL "LPA" CIRCUITS)

B3: 3" CONTROL CONDUIT (72#14 INCLUDING 6 SPARES)
B4: 2" POWER/CONTROL CONDUIT ONLY WITH PULL WIRE

C CONDUIT IN TRENCH CROSS SECTION DETAIL 2

SCALE: NTS



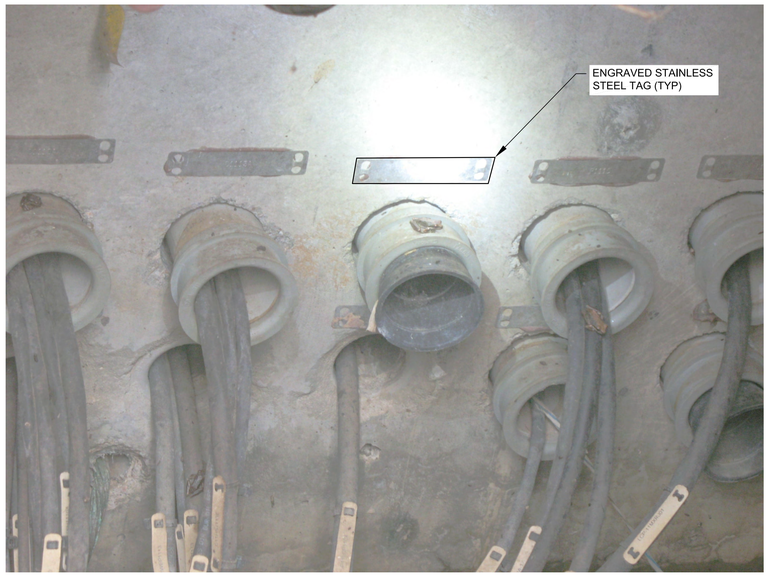
NOTE:

1. THIS DETAIL APPLIES TO 11-LCP-001, 002 AND 003 EXCEPT PANEL 11-LCP-001 IS FACING INWARD TOWARD CONTAINMENT AREA.

E331A TYP CONTROL PANEL SUPPORTS

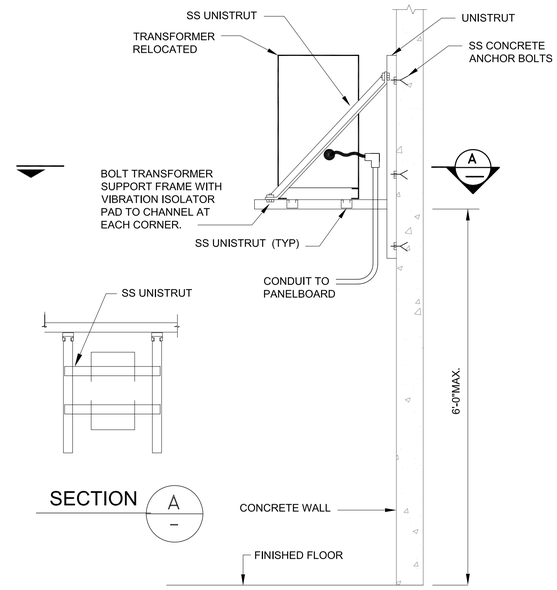
SCALE:NTS

FOR DEVICES LOCATED OUTSIDE CONTAINMENT AREA



E808 TYP CONDUIT TAGS IN UNDERGROUND PULL BOX

SCALE:NTS



NOTES:

1. TRANSFORMER SHALL BE OFFSET IN SUCH A MANNER THAT CLEARANCE IS PROVIDED FOR CONDUITS TO PANELBOARD.

D WALL MOUNTED TRANSFORMER

SCALE: NTS

ENGINEERS, INC.
Oakland, San Francisco, Orange County, CA

DATE: 04/30/2024
DESIGNED BY: DTN
DRAWN BY: TP
CHECKED BY: DN

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
DUC TAN NGUYEN
No. E-18037
EXP. 6/30/25
ELECTRICAL
STATE OF CALIFORNIA
3/24

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

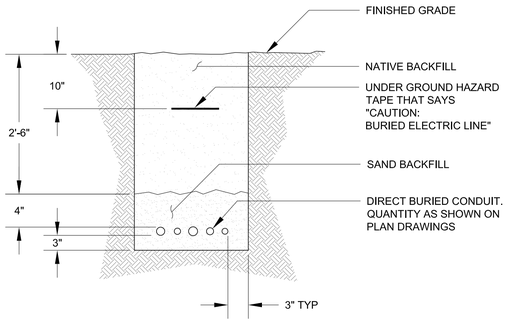
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
ELECTRICAL
CONSTRUCTION DETAILS - SHEET 3

SHEET
E-8

47 OF 55

34"x22" ORIGINAL SCALE IN INCHES 0 1 2

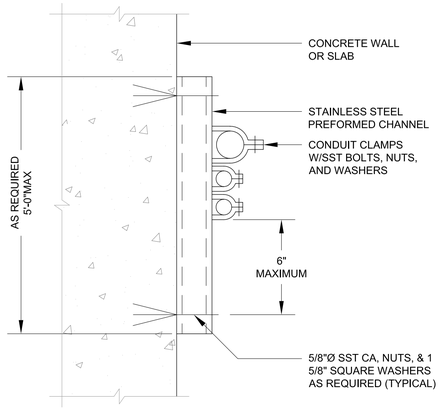
P:\482_Petaluma Chemical System Upgrade_Dudek\DRAWINGS\482_E08.dwg 04/30/2024 13:54



NOTES:

1. ALL DIMENSIONS ARE MINIMUM UNLESS OTHERWISE INDICATED ON THE DRAWINGS.
2. REFER TO SPECIFICATIONS FOR TRENCH BACKFILL REQUIREMENTS.
3. A SEPARATION OF MINIMUM 12-IN SHALL BE PROVIDED BETWEEN POWER AND COMMUNICATION CONDUITS.
4. UNDERGROUND HAZARD TAPE SHALL BE DETECTABLE, ALUMINUM BACKING, 6" WIDE, RED BACKGROUND WITH BLACK LETTERING.

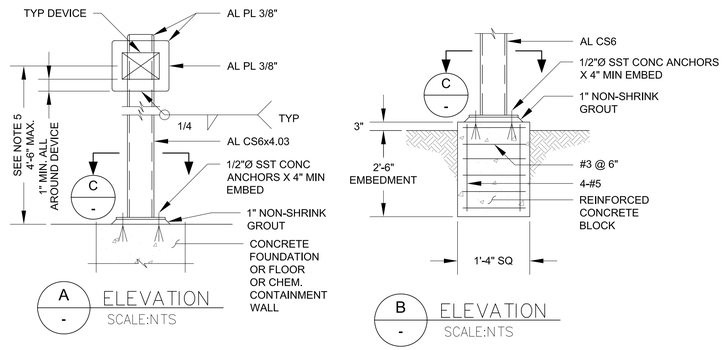
E131 TYP DIRECT BURIED CONDUIT
SCALE:NTS



NOTES:

1. THIS DETAIL TYPICAL FOR BOTH VERTICAL AND HORIZONTAL MOUNTING.
2. PREFORMED CHANNEL, FITTINGS, AND CLAMPS SHALL BE HOT-DIP GALVANIZED STEEL FOR NEMA 12 AREAS AND STAINLESS STEEL FOR NEMA 4X AREAS AND OUTDOOR LOCATIONS. FIELD COAT ALL CUTS PER SPECIFICATIONS.
3. CHANNELS TO BE SPACED AT 5'-0" OC MAXIMUM.

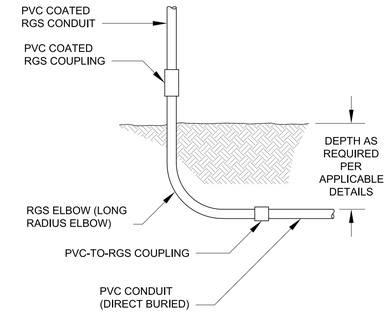
E303 TYP CONDUIT SUPPORT
SCALE:NTS



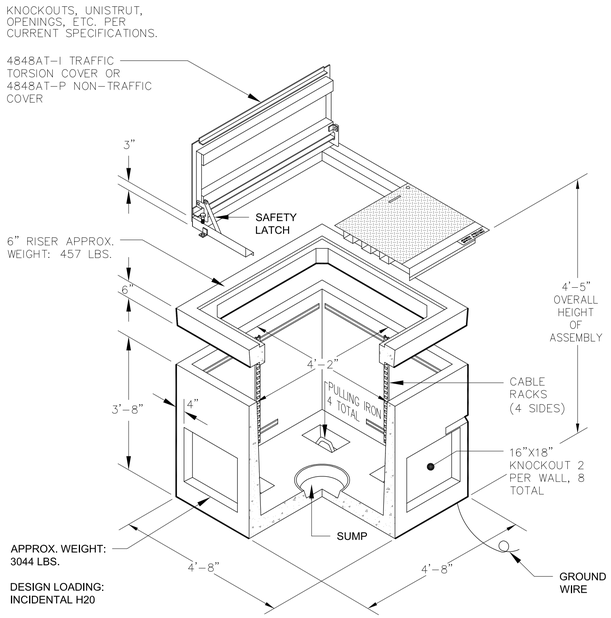
NOTES:

1. WHERE SEPARATE FOUNDATION IS REQUIRED, SEE B -
2. COAT ALUMINUM SURFACES IN CONTACT W/CONCRETE PER SPECS.
3. USE SST FASTENERS FOR MOUNTING DEVICES.
4. WEIGHT OF DEVICE(S) SHALL NOT EXCEED 100 POUNDS.
5. FOR SUPPORT FOR DEVICES MOUNTED ON CONTAINMENT WALL, 36" MAX. FROM BASE TO CENTER OF DEVICE.

E331 TYP DEVICE SUPPORT AND MOUNTING
SCALE:NTS

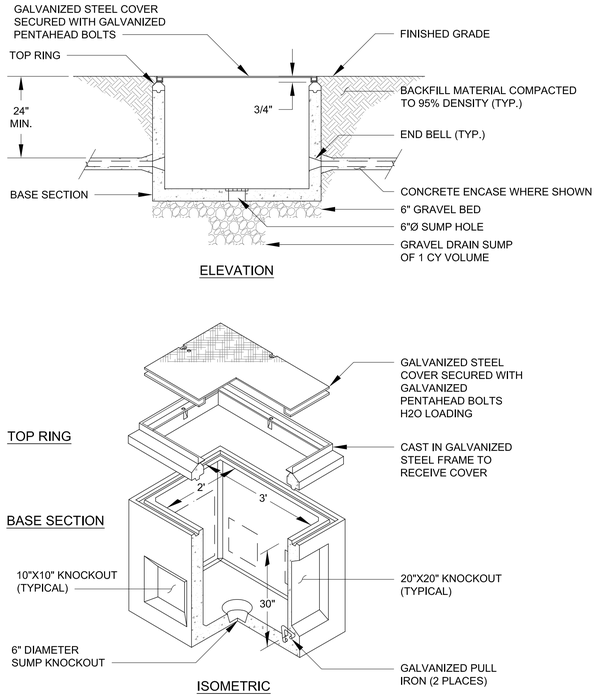


E375 TYP CONDUIT TRANSITION DETAIL
SCALE:NTS FOR DIRECT BURIED CONDUITS ONLY



MINIMUM 12" GRAVEL BED COMPACTED TO 95% SHALL BE PROVIDED AT BASE OF THE PULL BOX.

E703A TYP CONCRETE POWER/CONTROL PULLBOX
SCALE:NTS



E705 TYP SIGNAL PULL BOX
SCALE: NTS



1. SIMILAR STAINLESS STEEL TAGS SHALL BE PROVIDED FOR ALL EXPOSED CONDUIT TERMINATIONS.
2. SIMILAR STAINLESS STEEL TAGS SHALL BE PROVIDED FOR ALL UNDERGROUND CONDUIT TERMINATIONS.

E800 TYP CONDUIT TAGS
SCALE: NTS

DTN ENGINEERS, INC.
Oakland, San Francisco, Orange County, CA

DATE: 04/30/2024
DESIGNED BY: DTN
DRAWN BY: TP
CHECKED BY: DN

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
DIEP TAN NGUYEN
No. E-18037
EXP. 6/30/25
ELECTRICAL
STATE OF CALIFORNIA
9/24

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
ELECTRICAL
TYPICAL DETAILS

SHEET
E-9

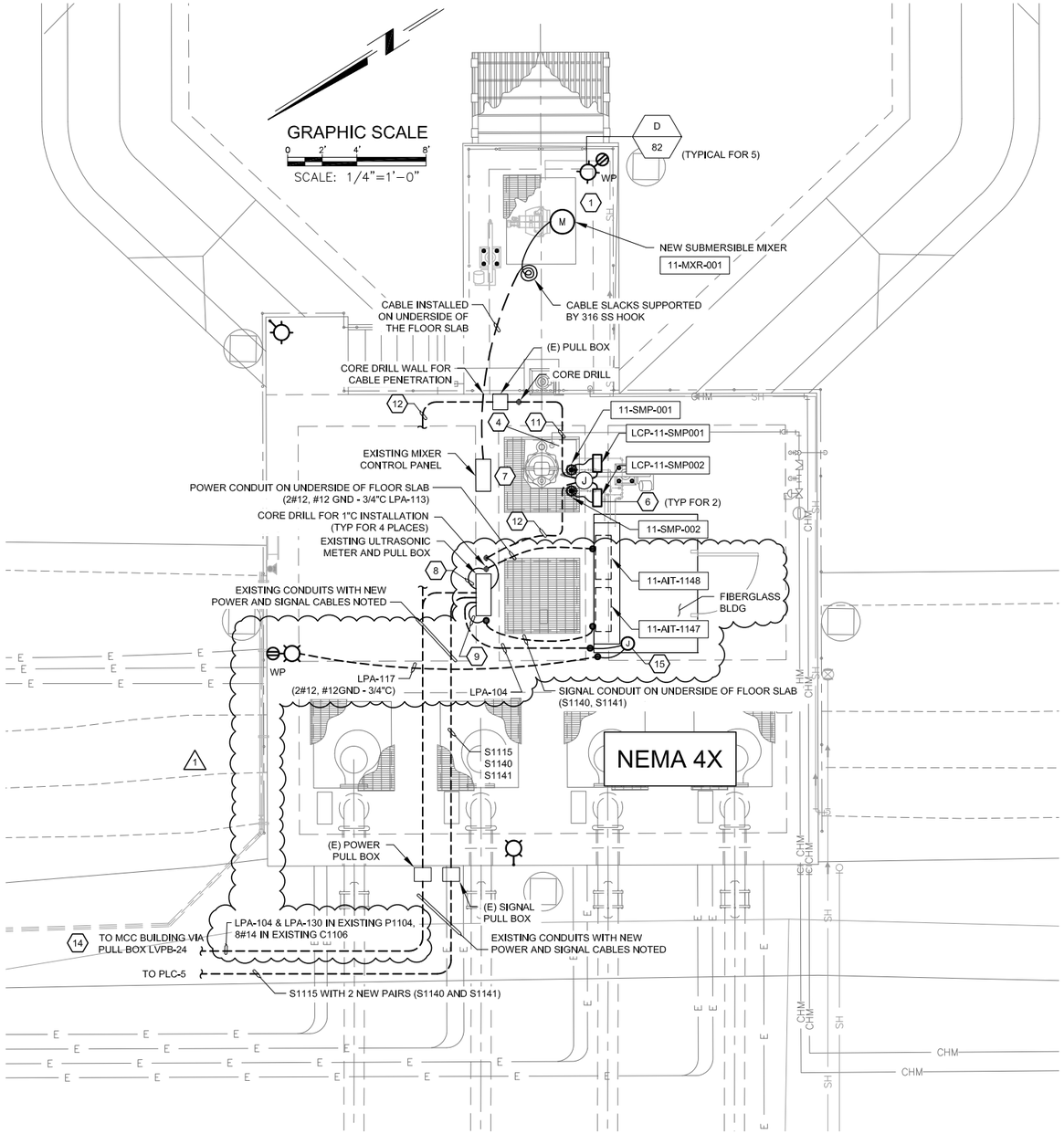
48 OF 55

34"x22" ORIGINAL SCALE IN INCHES 0 1 2

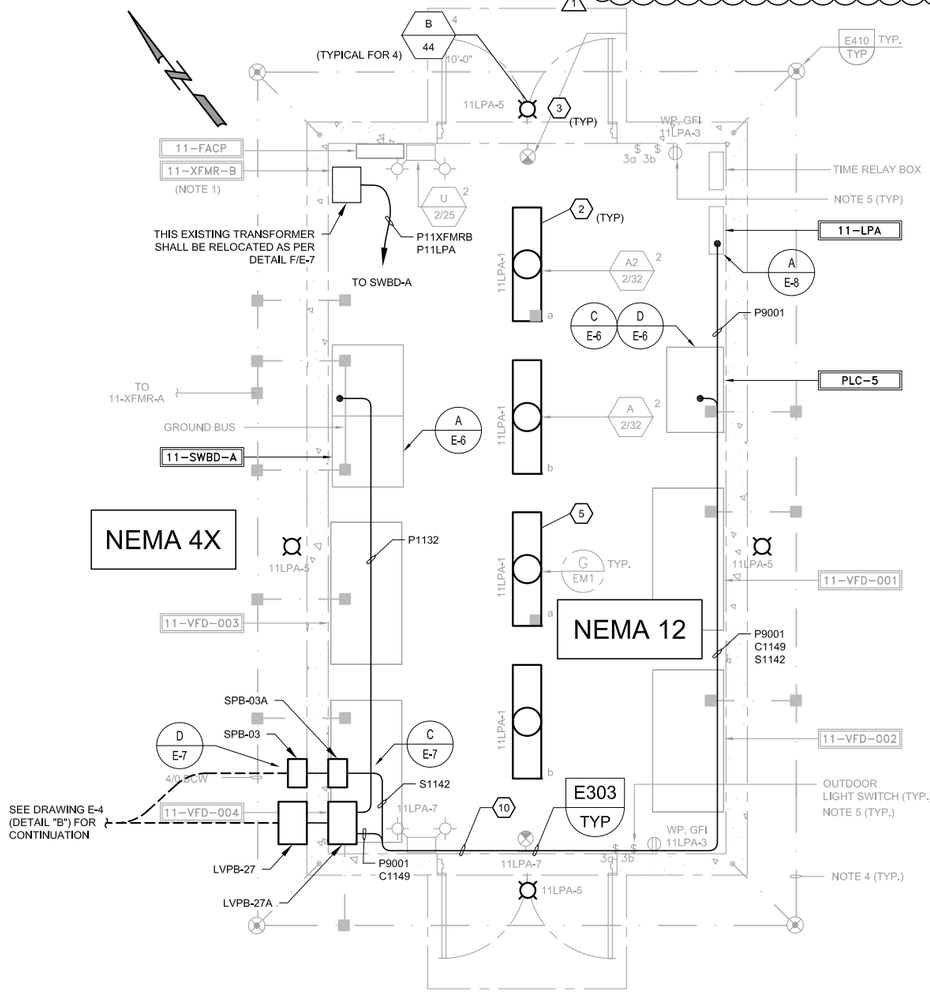
P:\482_Petaluma Chemical System Upgrade_Dudek\DRAWINGs\482_E09.dwg 04/30/2024 13:54

SHEET NOTES:

1. SEE NOTE 3 ON DRAWING E-11.
2. SEE NOTE 2 ON DRAWING E-11.
3. SEE NOTE 1 ON DRAWING E-11.
4. DISCONNECT AND REMOVE EXISTING SUBMERSIBLE MIXER FROM EXISTING CONTROL PANEL.
5. FOR THIS SPECIFIC LIGHT FIXTURE, REPLACE EXISTING T8 TUBE WITH STANDARD LED TUBE. DO NOT BYPASS NOR REWIRE EXISTING BALLAST WITH BATTERY BACKUP.
6. SEE TYPICAL DETAIL E331 AND DETAIL B/E-12.
7. DISCONNECT AND REMOVE EXISTING SUBMERSIBLE MIXER CABLE AND MIXER PRIOR TO INSTALLATION OF NEW FEEDER CABLE FOR NEW MIXER.
8. CONNECT TO EXISTING 120V POWER CIRCUIT TO FEED NEW ANALYZERS.
9. ROUTE 2 PAIRS IN EXISTING SIGNAL CONDUIT S1115 TO PLC-5.
10. ROUTE CONDUITS ALONG WALL AT 11 FT ABOVE FINISHED FLOOR TO AVOID CONFLICT WITH EXISTING DOORS AND EXIT SIGN.
11. LPA-130 (2#12, #12 GND - 3/4"C) MOUNTED ON UNDERSIDE OF FLOOR SLAB.
12. LPA-130 IN EXISTING P1104
13. 8#14 - 3/4"C (C1106C)
14. THE DISTANCE FROM THIS LOCATION TO MCC BUILDING VIA LOW VOLTAGE PULL BOX LVPB-24 IS APPROXIMATELY 120 FEET. SEE DETAIL B/E-4 FOR LOCATIONS OF PANEL LPA AND PLC5.
15. J-BOX FOR:
    a) LIGHT, FAN, HEATER LPA-104
    b) GFI OUTLET LPA-117



A — POWER, SIGNAL AND LIGHTING PLAN (NEMA 4X)
SCALE: 1/4" = 1'-0"



B — LIGHTING, SIGNAL AND POWER PLAN - "11-SWBD-A" BLDG
SCALE: 3/8" = 1'-0"

ADDENDUM 1 7/2/2024

ENGINEERS, INC.
Civil, Geotechnical, Water Resources, Energy, Surveying

DATE: 04/30/2024
DESIGNED BY: DTN
DRAWN BY: TP
CHECKED BY: DN

PROJECT NO.
C66501840

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

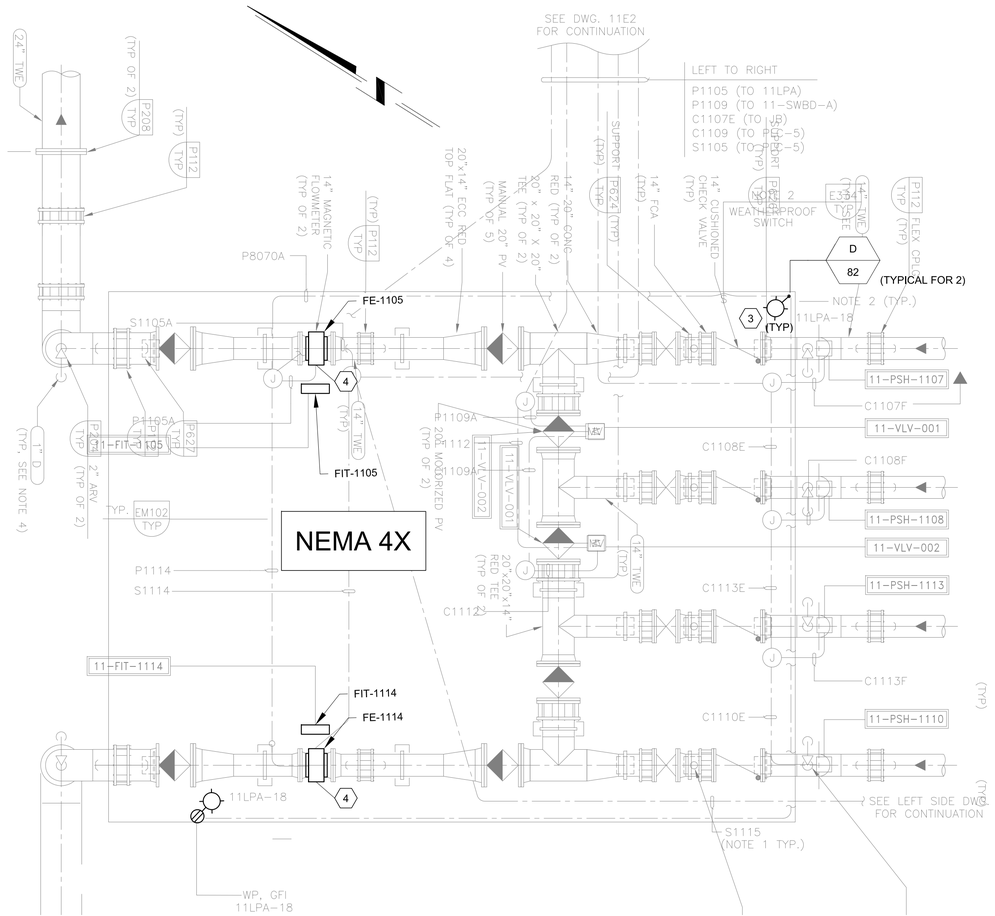
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
ELECTRICAL
LIGHTING IMPROVEMENT SHEET 1

SHEET
E-10

49 OF 55

34"x22" ORIGINAL SCALE IN INCHES 0 1 2

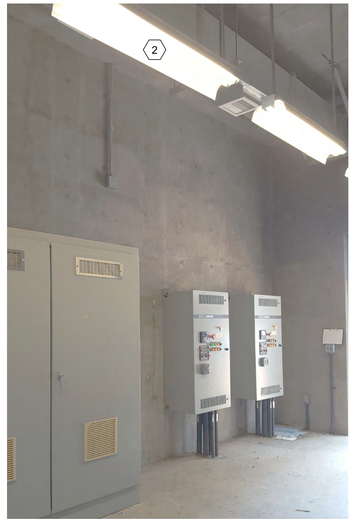
P1482_Petaluma Chemical System Upgrade_Dudek\DRAWING\e482_E10 Addendum 1.dwg 07/02/2024 09:33



A
—
LIGHTING AND SIGNAL PLAN (NEMA 4X)
SCALE: 1/4" = 1'-0"



B
—
FIXTURE TYPE "B" REPLACEMENT
SCALE: NTS



C
—
FIXTURE TYPE "A" REPLACEMENT
SCALE: NTS



D
—
FIXTURE TYPE "D" REPLACEMENT
SCALE: NTS

FIXTURE DESIGNATION	TYPE	QTY	VOLT	DESCRIPTION	MANUFACTURER	CATALOG NUMBER	LAMPS	MOUNTING
A / 2/18	LED	4	120V	EXISTING FLUORESCENT T8 TUBES TO BE REPLACED WITH LED TUBES.	EXISTING	EXISTING	LED	PENDANT MOUNTED
B / 44	LED	4	120V	COPPER-FREE ALUMINUM HOUSING FOR HARSH ENVIRONMENT, LED TYPE AREA LIGHT, BRONZE FINISH.	COOPER LIGHTING APPROVED EQUAL	GWC-SA1B-740-U-T3-BZ APPROVED EQUAL	LED	WALL MOUNTED
C / 82	LED	8	120V	POLE MOUNTED, LED, ROADWAY TYPE LED, 10 YR. WARRANTY, 15' ALUMINUM STRAIGHT POLE WITH PROVISION FOR AN OUTDOOR CONVENIENCE OUTLET, POLE TO WITHSTAND 80 MPH WIND.	COOPER LIGHTING APPROVED EQUAL	GALN-SA2B-740-U-T3-QM-BZ APPROVED EQUAL	LED	15' STRAIGHT ALUMINUM POLE SSA4T15WFN1
D / 82	LED	7	120V	POLE MOUNTED, LED, ROADWAY TYPE LED, 10 YR. WARRANTY, 10' ALUMINUM STRAIGHT POLE WITH PROVISION FOR AN OUTDOOR CONVENIENCE OUTLET, POLE TO WITHSTAND 80 MPH WIND.	COOPER LIGHTING APPROVED EQUAL	GALN-SA2B-740-U-T3-QM-BZ APPROVED EQUAL	LED	10' STRAIGHT ALUMINUM POLE SSA4T10WFN1

E
—
LIGHT FIXTURE SCHEDULE
SCALE: NTS

SHEET NOTES:

1. DISCONNECT AND REMOVE EXISTING HID FIXTURE. FURNISH AND INSTALL NEW LED LIGHT FIXTURE AS PER LIGHTING FIXTURE SCHEDULE.
2. REMOVE ALL EXISTING FLUORESCENT TUBES IN THESE LIGHT FIXTURE AND REPLACE THEM WITH BALLAST BYPASS 4FT LED REPLACEMENT TUBES. REWIRE TO BYPASS EXISTING BALLAST AS PER MANUFACTURER'S INSTRUCTIONS.
3. DISCONNECT AND REMOVE EXISTING HID LIGHT FIXTURE AND POLE. FURNISH AND INSTALL NEW LED FIXTURE AND POLE AS PER LIGHTING FIXTURE SCHEDULE. RECONNECT LIGHTING AND RECEPTACLE CIRCUIT WHERE POLE IS PROVIDED WITH A GFI WEATHER PROOF OUTLET.
4. DISCONNECT AND REMOVE EXISTING MAGNETIC FLOWMETER AND FLOW TRANSMITTER. FURNISH AND INSTALL NEW 14" MAGNETIC FLOWMETER AND FLOW TRANSMITTER AT SAME LOCATION. RECONNECT AND TEST FOR COMPLETE OPERATIONS.

ALL NEW FLOWMETERS AND TRANSMITTERS SHALL BE OF SAME BRAND, AND THUS EXISTING PIPING AND/OR ADDITIONAL FLANGE SHALL BE MODIFIED OR PROVIDED TO ACCOMMODATE COMPLETE REPLACEMENTS OF EXISTING FLOW SENSORS.

EXISTING FLANGE-TO-FLANGE DIMENSIONS OF FE-1105 AND FE-1114 ARE 20.5" AND 20.75" RESPECTIVELY.

NEW FLOW SENSOR SHALL BE PROVIDED WITH STANDARD 150LB FLANGE MATCHING WITH REQUIRED FLANGE-TO-FLANGE DIMENSIONS.

DTN ENGINEERS, INC.
Oakland, San Francisco, Orange County, CA

DATE: 04/30/2024
DESIGNED BY: DTN
DRAWN BY: TP
CHECKED BY: DN

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
DIEP TAN NGUYEN
No. E-18081
EXP. 6/30/25
ELECTRICAL
STATE OF CALIFORNIA

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
ELECTRICAL
LIGHTING IMPROVEMENT SHEET 2

SHEET
E-11

50 OF 55

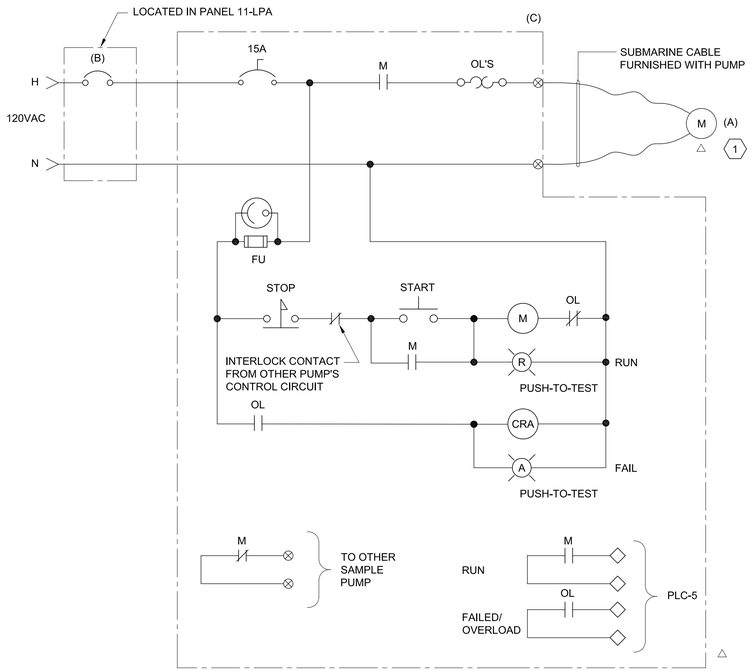
34"x22" ORIGINAL SCALE IN INCHES 0 1 2

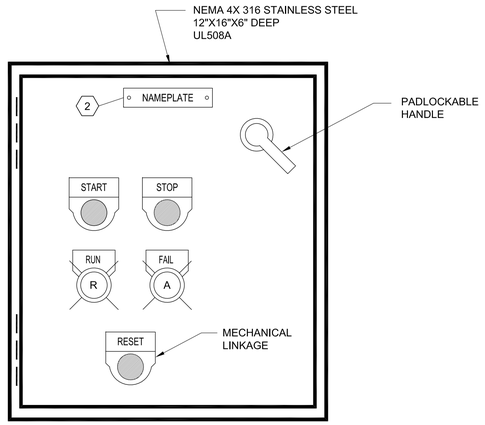
P:\482_Petaluma Chemical System Upgrade_Dudek\DRAWING\s482_E11.dwg 04/30/2024 13:55

SHEET NOTES:

1. REFER TO DRAWING E-10, DETAIL "A" FOR PHYSICAL LOCATION.
2. NAMEPLATE SHALL BE:

   LCP-11-SMP001
   LCP-11-SMP002





NOTES:

1. GROUNDING CONDUCTOR NOT SHOWN IS REQUIRED.

EQUIPMENT (A)	120VAC (B)	CONTROL PANEL (C)
SAMPLE PUMP 11-SMP-001	LPA-130	LCP-11-SMP001
SAMPLE PUMP 11-SMP-002	LPA-130	LCP-11-SMP002

A — SAMPLE PUMP CONTROL SCHEMATIC DIAGRAM
SCALE: NTS

B — CONTROL PANEL (1)
SCALE: NTS
TYPICAL FOR LCP-11-SMP001 AND LCP-11-SMP002

ENGINEERS, INC.
Oakland, San Francisco, Orange County, CA

DATE: 04/30/2024
DESIGNED BY: DTN
DRAWN BY: TP
CHECKED BY: DN

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
DIEP TAN NGUYEN
No. E-18037
Exp. 6/30/25
ELECTRICAL
STATE OF CALIFORNIA
4/30/24

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

SODIUM HYPOCHLORITE SYSTEM REPLACEMENT
AND RELOCATION
ELECTRICAL
SAMPLE PUMP CONTROL SCHEMATIC DIAGRAM

SHEET
E-12

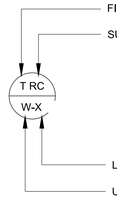
51 OF 55

34"x22" ORIGINAL SCALE IN INCHES 0 1 2

P:\482_Petaluma Chemical System Upgrade_Dude\DRAWINGs\482_E12.dwg 04/30/2024 13:56

INSTRUMENT IDENTIFICATION

EXAMPLE SYMBOLS





FIELD MOUNTED INSTRUMENT



REAR-OF-PANEL MOUNTED INSTRUMENT



PANEL MOUNTED INSTRUMENT



SHARED DISPLAY, SHARED CONTROL (PLC/IOS) PRIMARY LOCATION, NORMALLY ACCESSIBLE TO OPERATOR

SPECIAL CASES



FACE MOUNTED INSTRUMENT ON FIELD PANEL, OPERATOR ACCESSIBLE



ON AND OFF EVENT LIGHTS



OPENED AND CLOSED POSITION LIGHTS



OPENED AND CLOSED POSITION SWITCHES



ON-OFF HAND SWITCH. MAINTAINED CONTACT SWITCH (CONTROLLED DEVICE WILL RESTART ON RETURN OF POWER AFTER POWER FAILURE).



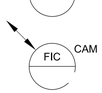
STOP-START HAND SWITCH MOMENTARY CONTACT SWITCHES (CONTROLLED DEVICE WILL NOT RESTART ON RETURN OF POWER AFTER POWER FAILURE).



ELECTRIC ACTUATOR WITH INTEGRAL OPEN-STOP-CLOSE MOMENTARY CONTACT CONTROL SWITCH.



FLOW INDICATING, COMPUTER/MANUAL CONTROL STATION



FLOW INDICATING, COMPUTER/AUTO/MANUAL CONTROL STATION

INTERNATIONAL SOCIETY FOR AUTOMATION TABLE (ISA)

	FIRST LETTER(S)		SUCCEEDING LETTERS		
LETTER	PROCESS OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS (+)		ALARM		
B	BURNER FLAME		USERS CHOICE (+)	USERS CHOICE (+)	USERS CHOICE (+)
C	CONDUCTIVITY			CONTROL	
D	DENSITY (S.G)	DIFFERENTIAL			
E	VOLTAGE		PRIMARY ELEMENT		
F	FLOW RATE	RATIO			
G	GAUGE		GLASS	GATE	
H	HAND (MANUAL)				HIGH
I	CURRENT		INDICATE		
J	POWER	SCAN			
K	TIME OR SCHEDULE			CONTROL STATION	
L	LEVEL		LIGHT (PILOT)		LOW
M	MOISTURE				MIDDLE
N	USERS CHOICE (+)		USERS CHOICE (+)	USERS CHOICE (+)	USERS CHOICE (+)
O	USERS CHOICE (+)		ORIFICE		
P	PRESSURE (OR VACUUM)		POINT (TEST CONNECTION)		
Q	QUANTITY OR EVENT(+)	INTEGRATE	INTEGRATE		
R			RECORD OR PRINT		
S	SPEED OR FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE (+)		MULTIFUNCTION (+)	MULTIFUNCTION (+)	MULTIFUNCTION (+)
V	VISCOSITY			VALVE OR DAMPER	
W	WEIGHT OR FORCE		WELL		
X	UNCLASSIFIED (+)		UNCLASSIFIED (+)	UNCLASSIFIED (+)	UNCLASSIFIED (+)
Y	EVENT			RELAY OR COMPUTE (+)	
Z	POSITION			DRIVE, ACTUATE OR UNCLASSIFIED FINAL CONTROL ELEMENT	

NOTE: (+) : WHEN USED, EXPLANATION IS SHOWN ADJACENT TO INSTRUMENT SYMBOL. SEE ABBREVIATIONS AND LETTER SYMBOLS.

TRANSDUCERS

A	ANALOG
D	DIGITAL
E	VOLTAGE
F	FREQUENCY
H	HYDRAULIC
I	CURRENT
P	PNEUMATIC
PD	PULSE DURATION
PF	PULSE FREQUENCY
R	RESISTANCE

EXAMPLE



CURRENT TO PNEUMATIC TRANSDUCER (BACK OF PANEL, IN A FLOW LOOP)

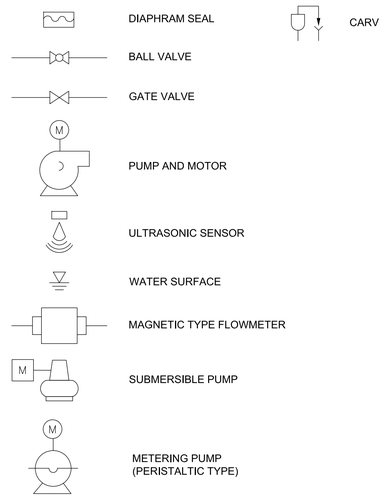


P : PLUG
C : CHECK
B : BUTTERFLY
S : SOLENOID
BL : BALL

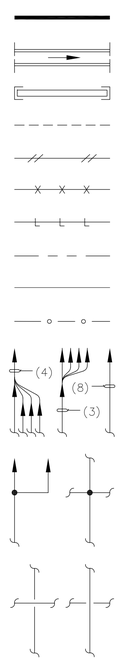
SELF CONTAINED VALVE & EQUIPMENT TAG NUMBERS

AHU	:	AIR HANDLING UNIT
ARV	:	AIR RELEASE VALVE
AVRV	:	AIR AND VACUUM RELEASE VALVE
CARV	:	COMBINATION AIR RELEASE VALVE
E	:	EJECTOR
FCV	:	FLOW CONTROL VALVE
G	:	GATE
LCV	:	LEVEL CONTROL VALVE
M	:	MECHANICAL EQUIPMENT
P	:	PUMP
PA	:	PLANT ABBREVIATION
PCV	:	PRESSURE CONTROL VALVE
PSV	:	PRESSURE RELIEF VALVE
T	:	TANK
TCV	:	TEMPERATURE CONTROL VALVE
VRV	:	VACUUM RELIEF VALVE
W	:	UNIT PROCESS NUMBER
X	:	LOOP NUMBER

MISCELLANEOUS SYMBOLS

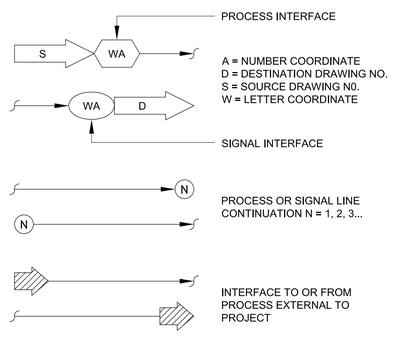


LINE LEGEND



PLC TERMINATIONS

INTERFACE SYMBOLS



ABBREVIATIONS & LETTER SYMBOLS

AI	ANALOG INPUT
AM	AUTO-MANUAL
AO	ANALOG OUTPUT
CAM	COMPUTER-AUTO-MANUAL
CM	COMPUTER-MANUAL
CP-X	CONTROL PANEL N0. X
CG	COMBUSTIBLE GAS
CO	CARBON MONOXIDE
CTEL	CONNECT TO EXISTING LINE
DI	DISCRETE INPUT
DO	DISCRETE OUTPUT
(E)	EXISTING
ES	EMERGENCY STOP
FLP	FAIL IN LAST POSITION
FM	FORCE MAIN
FOR	FORWARD-OFF-REVERSE
FR	FORWARD-REVERSE
FS	FAST-SLOW
H_2S	HYDROGEN SULFIDE
HOA	HAND-OFF-AUTO
HOR	HAND-OFF-REMOTE
HW	HEADWORKS
LOC	LOCAL (AT FIELD DEVICE)
LOI	LOCAL OPERATOR INTERFACE
LOS	LOCKOUT STOP
LP	LOCAL PANEL
L/S	LEAD-STANDBY
LR	LOCAL-REMOTE
MA	MANUAL-AUTO
MCC-X	MOTOR CONTROL CENTER-N0. X
MW	MOTOR WINDINGS
NS	NORTH-SOUTH
O_2	OXYGEN
OC	OPEN-CLOSE (D)
OCA	OPEN-CLOSE-AUTO
OCR	OPEN-CLOSE-REMOTE
OCU	ODOR CONTROL UNIT
OIS	OPERATOR INTERFACE STATION
OO	ON-OFF-RTU REMOTE TERMINAL UNIT
OOA	ON-OFF-AUTO
OOR	ON-OFF-REMOTE
ORP	OROXIDATION REDUCTION POTENTIAL
OSC	OPEN-STOP-CLOSE
PLC	PROGRAMMABLE LOGIC CONTROLLER
REV	REVERSE
SBD	SODIUM BISULFITE DRAIN
SCADA	SUPERVISORY CONTROL & DATA ACQUISITION
SHD	SODIUM HYPOCHLORITE DRAIN
SLOS	START-LOCKOUT-STOP
S/D	SEDIMENTATION-DEWATERING
S/D/C	SEDIMENTATION-DEWATERING-CLOSED
SS	START-STOP
VSD	VARIABLE SPEED DRIVE
VHC	VOLATILE HYDROCARBON
(*)	PROVIDED AS PACKAGED EQUIPMENT

GENERAL NOTES

1. P&ID'S ARE FOR INFORMATION ON CONTROL CONCEPTS AND INSTRUMENTATION ONLY. REFER TO PLANS AND SPECIFICATIONS FOR DETAILS.
2. THIS IS A STANDARD LEGEND. THEREFORE, NOT ALL OF THE SYMBOLS ARE USED IN THIS PROJECT.
3. REFER TO SPECIFICATION FOR LOCAL AND SCADA CONTROL LOGIC.
4. P&ID'S DO NOT SHOW ALL AUXILIARY SYSTEMS. REFER TO WIRING DIAGRAM DRAWINGS AND I/O LIST FOR COMPLETE QUANTITY OF SIGNALS REQUIRED.
5. COLOR OF FIELD WIRING CONDUCTORS AND PANELS. CONDUCTORS SHALL BE AS PER ELECTRICAL DIVISION 16 SPECIFICATIONS.
6. THE CITY RESERVES THE RIGHT TO RE-ASSIGN THE EQUIPMENT TAGNAMES AND THE LOOP NUMBERS TO SUIT SOFTWARE CONFIGURATION FOR NO ADDITIONAL COSTS TO THE OWNER DURING SHOP DRAWING SUBMITTAL PHASE OF THE PROJECT.
7. IN THIS SPECIFIC PROJECT, THE SCADA PLC SOFTWARE PROGRAMMING AND CONFIGURATION ARE CITY-FURNISHED. COORDINATION WITH PLC PROGRAMMER DURING CONSTRUCTION IS REQUIRED.

DIN ENGINEERS, INC.
Oakland, San Francisco, Orange County, CA

DATE: 04/30/2024
DESIGNED BY: DTN
DRAWN BY: TP
CHECKED BY: DN

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
DIEP TAN NGUYEN
No. E-18083
Exp. 6/30/25
ELECTRICAL
STATE OF CALIFORNIA
6/24

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
INSTRUMENTATION
P&ID LEGEND AND NOTES

SHEET
I-1

52 OF 55

34"x22" ORIGINAL SCALE IN INCHES 0 1 2

P:\482_Petaluma Chemical System Upgrade_Dudek\DRAWINGs\482_I01.dwg 04/30/2024 13:56

SHEET NOTES:

1. HEAVY DUTY, TANK GAUGE TYPE. SEE SPECS (DIV 11).
2. SEE SPECS (DIV 40) FOR ADDITIONAL REQUIRED SCREEN DISPLAYS AND POP-UP CONTROL SCREENS.
3. SCADA PLC SOFTWARE PROGRAMMING AND CONFIGURATION ARE CITY-FURNISHED, PERFORMED BY THIRD PARTY.
4. SEE DRAWING I-3 FOR DETAILS.
5. I/I CONDITIONER LOCATED IN PLC5 PANEL.

PLC/OIS PLC-5

FIELD

TANK X IN SERVICE

(E) FLOW SIGNAL FI-1105

FLOW-PACED

CL2 RES.-PACED

SODIUM HYPOCHLORITE STORAGE TANK NO. 1 (6,600 GAL)

SODIUM HYPOCHLORITE STORAGE TANK NO. 2 (6,600 GAL)

SODIUM HYPOCHLORITE STORAGE TANK NO. 3 (6,600 GAL)

SH PUMP NO. 1

11-CMP-005

PUMP SKID

SH PUMP NO. 2

11-CMP-006

PUMP SKID

VSD

11-LCP-003

11-LCP-001

11-LCP-002

11-T-001

11-T-002

11-T-003

11-MOV-001

11-MOV-002

11-MOV-003

11-HWH-001

11-EWS-001

11-EWS-002

SEE DWG. I-3

TO WEPS DOSING POINT

FILL CONNECTIONS

FROM EYEWASH STATION NO. 1

POST INDICATOR VALVE

TO PONDS

PERIMETER CONTAINMENT WALL

TO EYEWASH STATION NO. 2

EYEWASH STATION

POTABLE WATER

(*) PACKAGED PUMP SKID CONSISTING OF PUMP AND PERIPHERALS SUCH AS PUMP CONTROLLER, CALIBRATION CYLINDER, PULSATION DAMPENER, FLOW INDICATOR, PRESSURE GAUGES, VALVES ETC. SEE SPECS FOR COMPLETE REQUIREMENTS.

DTN | TP | DN

DATE: 04/30/2024

DESIGNED BY: DTN

DRAWN BY: TP

CHECKED BY: DN

DIN ENGINEERS, INC. Oakland, San Francisco, Orange County, CA

PROJECT NO. C66501840

DIOP TAN NGUYEN No. E-18083 EXP. 6/30/25 ELECTRICAL STATE OF CALIFORNIA 3/24

CITY OF PETALUMA

PUBLIC WORKS & UTILITIES

202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954

PH. 707-778-4546 FAX. 707-778-4508

SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION INSTRUMENTATION P&ID CHEMICAL SYSTEMS

SHEET I-2

53 OF 55

34"x22" ORIGINAL SCALE IN INCHES 0 1 2

P:\482_Petaluma Chemical System Upgrade_Dudek\DRAWINGs\482_I02.dwg 04/30/2024 13:56

SHEET NOTES:

1. SCADA PLC SOFTWARE PROGRAMMING AND CONFIGURATION ARE CITY-FURNISHED, PERFORMED BY THIRD PARTY.
2. REMOVE EXISTING MINICAS AND REPLACE, REWIRE WITH NEW MINICAS MODULE FURNISHED WITH NEW MIXER.
3. PUMPS ARE INTERLOCKED. ONLY ONE MAY OPERATE AT A TIME.

12N4

TO EXIST HYPO FEED SYSTEM
12N9

I-2

PV

PLC/OIS
PLC-5
1

NEW HYPO PUMP RUNNING
12N4

AUTO SS
KY 1104
DC 1104
SS CS 1104B
MA CS 1104A
FTS YA 1104
RTM KQI 1104
FAIL YA 1104
RUN YL 1104B
REM YL 1104A

FAIL YA 1147
RUN YL 1147
FAIL YA 1148
RUN YL 1148

AAL 1147
AAH 1147
AIR 1147
AI 1147
AAL 1148
AAH 1148
AIR 1148
AI 1148

FI 1105

(2)
(2)

LCP-11-SMP001
HS 1147 SS
HS 1147 RST
YA 1147 FAIL
YL 1147 RUN
I
3

LCP-11-SMP002
HS 1148 SS
HS 1148 RST
YA 1148 FAIL
YL 1148 RUN

CL2 HUT

PI 1147
FI 1147
ES
AIT 1147
AE 1147
TOTAL CL2 ANALYZER

PI 1148
FI 1148
ES
AIT 1148
AE 1148
TOTAL CL2 ANALYZER

FIELD

LCP-11MXR001
2
POWER ON JL 1104
LOR HS 1104A
HS 1104C RST
HS 1104B SLOS
NA 1104
FAIL YA 1104
UNDER LOAD JAL 1104
OL JAH 1104
RUN YL 1104
MOIST DETECT XA 1104
MTR TEMP TAH 1104

TO CHLORINE CONTACT BASIN (CCB)
12N1

ES
FIT 1105
14" MAGMETER
FE 1105
M

SEE DETAIL A/E-11 FOR THE SECOND FLOWMETER FIT-1114 TO BE REPLACED WITH NEW UNIT AS WELL

FROM HYPO FEED PUMPS
12N4
HCS

FROM POND 9
11N1

MTR TEMP TSH 1104 *
MOIST DETECT XS 1104 *
M
11-MXR-001
SUBMERSIBLE MIXER

(*) PART OF MIXER PACKAGE

M
11-SMP-001
SAMPLE PUMP

M
11-SMP-002
SAMPLE PUMP

WETLANDS PUMP STATION

ENGINEERS, INC.
Oakland, San Francisco, Orange County, CA

DATE: 04/30/2024
DESIGNED BY: DTN
DRAWN BY: TP
CHECKED BY: DN

PROJECT NO.
C66501840

REGISTERED PROFESSIONAL ENGINEER
DUC TAN NGUYEN
No. E-18087
EXP. 6/30/25
ELECTRICAL
STATE OF CALIFORNIA
6/30/24

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

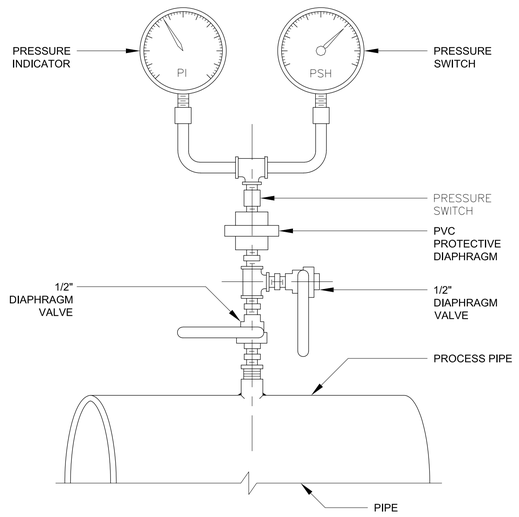
SODIUM HYPOCHLORITE SYSTEM REPLACEMENT
AND RELOCATION
INSTRUMENTATION
P&ID MIXER AND SAMPLE PUMPS

SHEET
I-3

54 OF 55

3.4"x22" ORIGINAL SCALE IN INCHES 0 1 2

P:\482_Petaluma Chemical System Upgrade_Dude\DRAWINGS\482_I03.dwg 04/30/2024 13:56

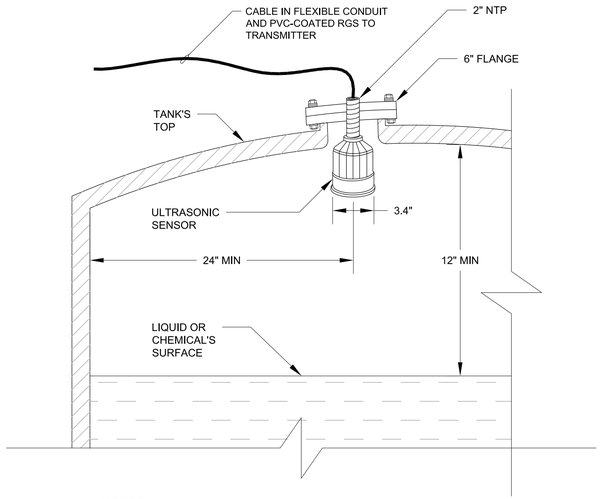


NOTES:

1. USE STAINLESS STEEL DIAPHRAGM SEALS AND VALVES FOR ALL CHEMICALS.
2. ALL PIPING SHALL BE SCH. 80 PVC.
3. NO METAL PARTS SHALL COME IN CONTACT WITH CHEMICAL SOLUTIONS.

E101C TYP PRESSURE GAUGE WITH DIAPHRAGM SEAL

SCALE:NTS

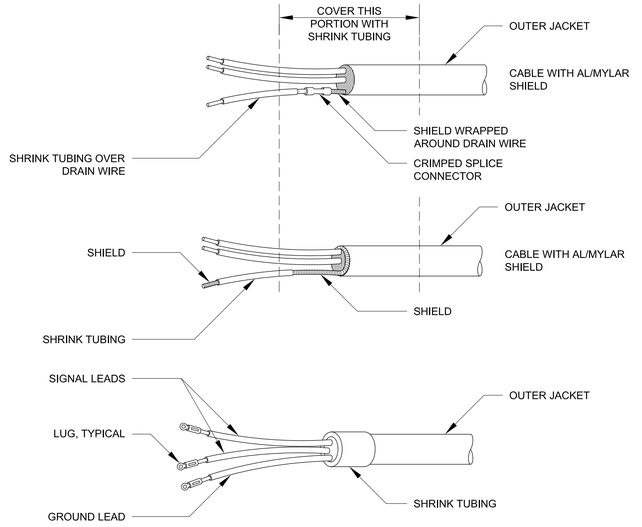


NOTES:

1. FOLLOW MFR'S INSTALLATION INSTRUCTIONS.
2. CHEMICAL IN THIS PROJECT IS SODIUM HYPOCHLORITE.
3. THIS DETAIL IS TYPICAL FOR THREE TANKS.

E105B TYP ULTRASONIC SENSOR FOR TANK

SCALE:NTS

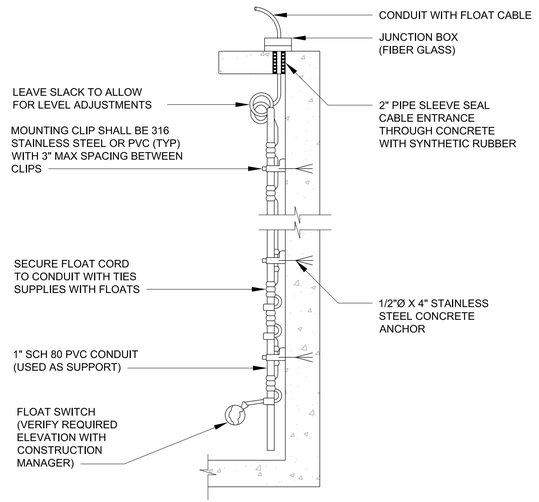


NOTES:

1. SHIELD GROUNDED AT TERMINATION CABLES MAY BE MULTIPLE PAIRS.
2. FOR USE WHENEVER SHIELDED CONTROL CABLES ARE USED. APPLIES AT TERMINATIONS WHERE SHIELD IS TO BE ROUNDED. SEE OTHER DETAILS FOR GROUNDING SHIELD. GROUND ONE END OF CABLE ONLY AT THE PLC ENCLOSURE.

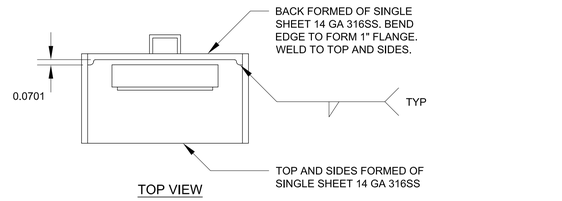
E120 TYP TERMINATION OF SHIELDED ANALOG SIGNAL

SCALE:NTS

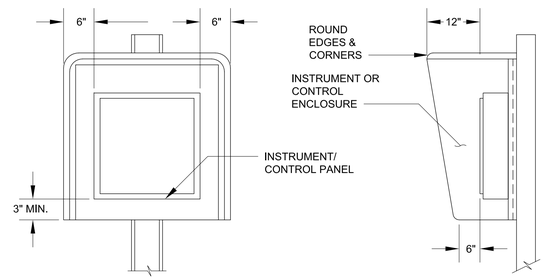


E334 TYP FLOAT SWITCH MOUNTING

SCALE:NTS



TOP VIEW



FRONT VIEW

SIDE VIEW

NOTES:

1. ALL EXPOSED EDGES TO BE GROUND SMOOTH AND BURR FREE.
2. MOUNT SUN SHIELD BETWEEN INSTRUMENT AND STANCHION. USE STAINLESS STEEL BOLTS AND INSULATING WASHERS AND SLEEVES.

E364 TYP TRANSMITTER SUNSHIELD

SCALE:NTS

DTN ENGINEERS, INC. Oakland, San Francisco, Orange County, CA

DATE: 04/30/2024
DESIGNED BY: DTN
DRAWN BY: TP
CHECKED BY: DN

PROJECT NO. C66501840

REGISTERED PROFESSIONAL ENGINEER DIEP TAN NGUYEN No. E-18037 EXP. 6/30/25 ELECTRICAL STATE OF CALIFORNIA 03/24

CITY OF PETALUMA
PUBLIC WORKS & UTILITIES
202 N. McDowell Blvd., PETALUMA, CALIFORNIA, 94954
PH. 707-778-4546 FAX. 707-778-4508

SODIUM HYPOCHLORITE SYSTEM REPLACEMENT AND RELOCATION
INSTRUMENTATION CONSTRUCTION DETAILS

SHEET I-4

55 OF 55

3.4"x22" ORIGINAL SCALE IN INCHES 0 1 2

P:\492_Petaluma Chemical System Upgrade_Dudek\DRAWINGS\492_I04.dwg 04/30/2024 13:56