

CONTRACT DOCUMENTS FOR
PAYRAN LIFT STATION REHABILITATION
PROJECT

CITY PROJECT NUMBER C66501519
VOLUME 1 OF 2

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

CITY OF PETALUMA - SONOMA COUNTY - CALIFORNIA

Department of Public Works and Utilities
202 N. McDowell Blvd., Petaluma, CA 94954
Phone: (707) 778-4546 Fax: (707) 778-4508

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

Engineers, Attention: Daniel A. Herrera, P.E.
202 N. McDowell Blvd., Petaluma, CA 94954
Phone: (707) 778-4589 Fax: (707) 778-4508

August 2020

CITY OF PETALUMA
PETALUMA, CALIFORNIA

PAYRAN LIFT STATION REHABILITATION



**CITY PROJECT NUMBER:
C66501519
VOLUME 1 OF 2**

CITY OF PETALUMA - SONOMA COUNTY - CALIFORNIA

Prepared by:

Daniel A. Herrera, P.E. #C77596

8/25/2020

Date Signed

City of Petaluma

Company/Firm Name

Prepared by:

Mark Wilson, PE #C47988

8/12/20

Date Signed

Nute Engineering

Company/Firm Name

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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, California, 94952-2610, until 2:00 PM (enter time) on Thursday, September 24, 2020, for the Payran Lift Station Rehabilitation, C66501519. 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, September 24, 2020 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 within 110 working days after the commencement date stated in the Notice to Proceed.
4. **DESCRIPTION OF WORK:** The WORK includes modifications to the existing pump station including but not limited to the following: forcemain tie-in, dry pit valve replacement, removal and replacement of submersible pumps, wet well top replacements, electrical equipment, controls and instrumentation, bypass pumping during construction, site work, and related work as shown in the Contract Documents99.
5. **SITE OF WORK:** The site of the WORK is located: 8-12 Jess Avenue, Petaluma, CA.
6. **OBTAINING CONTRACT DOCUMENTS:** The Contract Documents are entitled "Payran Lift Station Rehabilitation, C66501519."

The Contract Documents may be obtained by 4:00 P.M., Monday through Thursday at the office of Public Work & Utilities, 202 North McDowell Boulevard, Petaluma, California 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

Submitting 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 bid by email.

If you would like to purchase bid documents, please call Phone No. 707-778-4585, Attention: Tiffany Avila, upon payment of \$50.00 (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 Digitech, 1340 Commerce St., Suite K, Petaluma, CA. 94954,

(707) 769-0410.

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.
9. **PREFERENCE FOR MATERIAL:** 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 or 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.
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 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. 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.
13. **LABOR COMPLIANCE PURSUANT TO CALIFORNIA LABOR CODE §1771.1:** A contractor or 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 this chapter, unless currently registered and qualified to perform public work pursuant to Section 1725.5. It is not a violation of this section for 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 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 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 of 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 3247, a payment (labor and materials) bond must be filed if the expenditure for the WORK is in excess of Twenty-Five Thousand Dollars (\$25,000).

16. **PRE-BID CONFERENCE VISITS:** [At least on 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 3:00pm (*enter time*) on September 17, 2020, at the Payran site. 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.

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

NAME: Dan Herrera, PE
ADDRESS: Department of Public Works and Utilities
202 North McDowell Boulevard
Petaluma, CA 94954
PHONE: (707) 778-4589

18. **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: J. Pascoe
DATE: 8-20-20

END OF NOTICE 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 state 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 (5th) 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

SECTION 1

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 data 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 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)

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 _____ 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	Total Price
1.	Complete work in accordance with the Contract Documents	1	LS	\$ _____

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

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. 3 Signature Acknowledging Receipt: _____ Date: _____

SCHEDULE OF VALUES

All Bidders shall submit a Schedule of Values as specified herein as an attachment to the Bid.

- A. The Schedule of Values (SOV) submitted with this bid package is for informational purposes only. The SOV will in no way be used to determine the lowest responsible bidder. The Contract amount shall be determined solely by the Lump Sum amount in the Bid Schedule as part of the contract documents.
- B. The SOV categories were selected by the City of Petaluma to be representative of the Contract Work. The Contractor shall determine the work to be incorporated into each of the City’s selected categories. The total should add up to the Lump Sum amount stated on the Bid Schedule. A more detailed SOV will be required after the award of Contract, during the submittal process as required by the Contract Documents.
- C. On the following table, state the approximate cost for each construction category:

Construction Category	Construction Cost
<u>General</u> (Includes but not limited to mob/ demob, demolition, startup, and bypass pumping)	
<u>Mechanical</u> (Includes but not limited to wet well work, piping, valving, vaults, pumps, meters)	
<u>Electrical</u> (Includes but not limited to electrical, instrumentation, site security and lighting)	
<u>Building</u> (Includes but not limited to climate control, walls, and interior work)	
<u>Site Improvements</u> (Includes but not limited to fencing, water line, grading)	
<u>Generator</u> (Includes but not limited to all work for the replacement of generator,)	
<u>Total</u> (Should match bid schedule lump sum)	

QUESTIONNAIRE AND FINANCIAL ASSURANCE STATEMENT

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

The Bidder 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 Bidder, 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:

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

The following complaints have been made against the Bidder'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 bidder:

NAME OF BANK	ADDRESS

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

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 BIDDER

DATE

NAME OF BIDDER

END OF
QUESTIONNAIRE AND FINANCIAL STATEMENT FORM

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

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

**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

STATEMENT OF QUALIFICATIONS

All Bidders shall submit a Statement of Qualifications as specified herein as an attachment to the Bid Documents.

- 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.
 2. Satisfactory experience on public works projects, with no history of default termination within 5 years.
 3. Within the past five years, completed two construction projects of a similar nature (Sewer Lift Station) and complexity with a contract dollar amount of at least \$300,000 each.
 4. 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.
 5. Interstate Experience Modification Rate of 1.20 or less for both multi-year average and last year.
 6. Evidence that Bidder and its team, including without limitation, its Electrical, Mechanical, and Instrument and Controls Subcontractors, including the Bidder to the extent Bidder performs such Work itself, (hereafter "designated Subcontractors"), have the human and physical resources of sufficient quantity and quality to perform the Work under Contract Documents in a timely and Specification-compliant manner, to include:
 - a. Construction and management organizations with sufficient personnel and requisite disciplines, licenses, skills, experience, and equipment for the Project. Provide names and resumes of Project Manager and Superintendent.
 - b. Expertise of Key Personnel to accomplish the duties and responsibilities required to perform the Work under Contract Documents. Minimum experience requirements of Key Personnel including the completion of two projects of similar nature and complexity and having five years of experience on projects of similar nature and complexity.

9. Any history within the past five (5) years that Bidder ever failed to complete a public works construction project in Petaluma within the time allowed by the contract, including written agreed upon contract time extensions or liquidated damages will eliminate bidder. For any other jurisdictions, Bidder shall provide failure to complete history within last five (5) years. Information to include: jurisdiction name, address, telephone number of the owner of such public works construction project including the name of the agencies' contact person, and further, describe in detail the nature of the improvement work.
- B. The following are minimum requirements for the designated Subcontractors to be found responsible to perform the Work. (Unless the designated Subcontractors are found responsible, Bidder will be found non-responsible.)
1. Evidence that Bidder's named Mechanical Subcontractor has the resources of sufficient quantity and quality to perform those aspects of the Contract in a timely and Specification-compliant manner, to include:
 - a. Minimum experience requirements including the completion of four projects of similar nature and complexity with contract dollar amounts of at least \$50,000 each within the past three years.
 - b. The installation supervisor shall have worked in a similar capacity on at least four projects similar in nature and complexity to this Project.
 2. Evidence that Bidder's named Electrical Subcontractor has the resources of sufficient quantity and quality to perform those aspects of the Contract in a timely and Specification-compliant manner, to include:
 - a. Minimum experience requirements including the completion of four projects of similar nature and complexity with contract dollar amounts of at least \$50,000 each within the past three years.
 - b. The installation supervisor shall have worked in a similar capacity on at least four projects similar in nature and complexity to this Project.
- C. 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.

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 Payran Lift Station Rehabilitation C66501519 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

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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 not 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 rating 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 all 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 quantities of 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, expeditors, 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 the 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 in 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 made 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 shall 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

**SUPPLEMENTARY GENERAL
CONDITIONS**

(NOT USED)

SECTION IV
SPECIAL PROVISIONS

SECTION IV

SPECIAL PROVISIONS

4-1 DESCRIPTION OF WORK -- The work includes but not limited to the following: modifications to existing lift station, demolition, removal and replacement of two submersible pumps, valves replacement, discharge headers and valves, painting, ventilation, structural concrete, electrical system removal and replacement, emergency pump suction piping, electrical equipment, emergency generator, controls, and instrumentation (alarms, SCADA, PLC, etc.), bypass pumping during construction, startup and testing of all systems, and all other work specified in these special provisions and as shown on the plans.

4-2 CONTRACT DOCUMENTS -- If the CONTRACTOR discovers any errors, omissions, discrepancies, or conflicts in the Contract, he/she shall immediately so inform the ENGINEER in writing. The ENGINEER will promptly clarify such matters by issuing addenda or change orders. 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) Drawings
- 5) Technical Specifications
- 6) Supplemental General Conditions (if any)
- 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.

4-3 COOPERATION -- Attention is directed to Sections 7-1.14, "Cooperation", and 8-1.10, "Utility and Non-Highway Facilities", of the Standard Specifications and these special provisions.

The Contractor shall be advised that the project is located at the operating Payran Lift Station. All areas of work shall be open to City staff during the construction of this project. The

Contractor will notify the City at least seven (7) working days prior any work related to this project. The Contractor will provide safe access to all areas and equipment as requested by City. All costs for performing the aforementioned work shall be included in the cost of the associated item and no separate payment will be made.

The CONTRACTOR shall NOT adjust water, sewer, gas, electric, television cable, telephone, or other structures. The CONTRACTOR will notify each agency who will in turn 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.

4-4 OBSTRUCTIONS -- Attention is directed to Sections 8-1.10, "Utility and Non-Highway Facilities", and 15, "Existing Highway 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 six (6) inches in diameter or pipelines operating at pressures greater than sixty (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 operation of subsurface installations at least five (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: 811 or (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, 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.

4-5 ORDER OF WORK -- Order of work on Payran Lift Station Upgrade shall conform to the provision in Section 5-1.05, "Order of Work", of the Standard Specifications, the technical specifications as party of the contract documents, and these special provisions.

The CONTRACTOR shall submit a work plan to the CITY for review and shall identify proposed order of work to maximize efficiency of construction, minimize impact to the facility and maintain safety.

All work shall be performed Monday through Friday between the hours of 7:00 a.m. and 5:00 p.m.

"Night Hours" shall not be permitted unless in case of emergency.

No work shall be done on designated legal holidays: 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.

4-6 WATER – Only non-Potable water is available at the Lift Station Facility. The Contractor may elect to use a hydrant meter on a City fire hydrant.

4-7 PROGRESS SCHEDULE -- The CONTRACTOR shall submit a schedule which includes all major tasks and milestones to the City of Petaluma, Public Works and Utilities Department for review at least ten (10) working days prior to start of work.

After beginning of work, updated schedules shall be submitted bi-monthly with requests for payment. No progress payments will be processed without an accepted updated schedule.

Payment for the original schedule and updated, monthly schedules shall be considered to be included in the various items of work and no additional compensation will be allowed therefore.

4-8 SUPERINTENDENCE -- The CONTRACTOR shall designate in writing before 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 the designation shall require prior approval of 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.

Said authorized representative shall be present at the site of work at all times while work is actually in progress on the contract. When work is not in progress and during periods when work is suspended, arrangements acceptable to the ENGINEER shall be made for any emergency work, 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 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 CONTRACTOR'S authorized representative 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 superintendent or foreperson who may have charge of the particular work or it will be given to and be obeyed by any worker in the area should the superintendent or foreperson 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.

4-9 SAFETY REQUIREMENT -- The CONTRACTOR shall comply with all CAL/OSHA 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) 762-2727 or (707) 762-4545 from a cellular phone, if any gas lines or electrical power lines are broken or damaged.

4-10 PROJECT APPEARANCE -- CONTRACTOR shall maintain a neat appearance to the work area.

When practicable, debris developed during construction shall be disposed of concurrently with its removal. Stockpiling on the street shall not be allowed. 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 his staging and/or stockpiling areas.

The CONTRACTOR shall provide dust control as often as required during the construction.

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.

4-11 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.

4-12 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.

4-13 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 \$1,500 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.

4-14 GENERAL CONDITIONS Article 17.7 - RETENTION PROCEEDS; WITHHOLDING; DISBURSEMENT-- Attention is directed to these special provisions.

Paragraph A-2 shall read: The retention shall be released within sixty (60) days after the acceptance of project completion by the City Council.

4-15 RECORD ("AS-BUILT") DRAWINGS -- CONTRACTOR shall furnish Record Drawings of the complete project. Procure from the ENGINEER 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. 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 ENGINEER before the final acceptance of the project. If the CONTRACTOR fails to provide the CITY with an acceptable "Record Drawings", the CITY may deduct \$3,000 from the amount due CONTRACTOR.

4-16 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 as 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 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 General Provisions, Section 7A, "Extra Work and Force Account Work".

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 ten (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.

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.

4-17 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 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 the contract price for the contract items in which the material is intended to be used.

4-18 MEASURE AND PAYMENT – Measure and payment for the “PAYRAN LIFT STATION UPGRADE” shall be based on the CONTRACTOR'S approved lump sum price which shall include, but not limited to, full compensation for furnishing all labor, materials, tools, equipment, and incidentals required to remove and install pumps, valves, piping, appurtenances, flowmeters, connections to existing pipelines, electrical, mechanical, instrumentation, testing, building construction, site work, and all work necessary to complete the WORK as indicated in the Contract Documents.

4-19 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 shall be used.

4-20 EXTENSION OF CONTRACT TIMES FOR DELAY DUE TO WEATHER

GENERAL CONDITIONS, ARTICLE 12.2 shall read:

- A. The contractor's construction schedule shall anticipate delay due to unusually severe weather. The contract time allows for adequate construction during and no time extensions due to non-workable weather construction will be granted for work. The CONTRACTOR shall plan for and base his construction schedule upon weather conditions anticipated during all months of construction.

4-21 SITE MANAGEMENT– Contractor shall comply with all Federal, State and local regulations and ordinances governing storm water pollution prevention.

Site management shall include, but not be limited to minimizing site disturbance, installing and having sediment and erosion control materials on site as required for construction conditions. The Contractor shall be responsible for providing the measures that would comply with SWRCB and RWQCB requirements. The Contractor shall employ and utilize environmental protection and fully observe all local, state, and federal regulations.

The Contractor shall place approved materials at all areas to prevent any silt or construction debris from entering the storm drain system or any creek. The Contractor shall also place drain rock bags around storm drain inlets/catch basins within 100 feet of the work/staging area.

The Contractor shall, at a minimum, provide 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. Liquid Waste Management.
6. Hazardous Waste Management.
7. Employee and Subcontractor Training.
8. Vehicle and Equipment Fueling and Maintenance.
9. Spill Prevention and Control.
10. Sawcutting.

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.

4-22 PROJECT AND CONSTRUCTION AREA SIGN– Project sign and construction area signs shall be furnished, installed, maintained, and removed when no longer required in accordance with the provisions in Section 12, “Construction Area Traffic Control Devices”, of the Standard Specifications.

One (1) project signs with a minimum dimension of 3’X4’X3/4” plywood bolted to an A-frame barricade shall be furnished, installed and moved from site to site by the Contractor. Letters and numbers shall be black on a white background. The sign information shall be as shown below:

CITY OF PETALUMA (4” LETTERS)

PROJECT: PAYRAN LIFT STATION REHABILITATION PROJECT

FUNING: CITY FUNDS (3” LETTERS)

PROJECT MANAGER: DAN HERRERA (3” LETERS)

PHONE: 707-778-4589

The signs shall be approved prior to fabrication and posted as directed by the Engineer.

Construction area signs will be installed prior to start of construction and maintained in place for the duration of the project by the CONTRACTOR. When installed, the signs shall not extend beyond the street curb alignment into the travel way. Signs shall be repaired or replaced at no cost to the City of Petaluma, if damaged or stolen. The CONTRACTOR shall remove the signs and posts at the completion of the project and with prior approval of the ENGINEER.

All costs involved in purchasing and installing construction area and project signs shall be considered as included in the Lump Sum price paid for Traffic Control System.

One project sign with a minimum dimension of 5 feet wide by 4 feet high and ¾ inch thick plywood bolted to two 4 inch by 4 inch posts shall be furnished and installed. The location and format shall be submitted for the City’s approval. Letters shall be black on a white background. The sign information shall include the project title, project number, Funding Source: Wastewater Fund, Contractor Name and emergency phone numbers.

4-23 CITY PERFORMANCE STANDARDS AND NOTIFICATIONS – All equipment, including the bypass pumping, generators, and construction equipment shall comply with the City’s Performance Standards, including limitation on noise. Construction activities shall comply with performance standards specified Implementing Zoning Ordinance Chapter 21 and the Petaluma Municipal Code Sections (noise, dust, odor, etc.) unless as otherwise noted/conditioned above. All mitigation measures required to comply shall be the responsibility of the contractor. At least 48 hours prior to the commencement of any demolition work or heavy machinery use, the contractor shall notify all residences within 300 feet of planned construction. The notice shall include the expected start and end and times, along with a brief

description of the activity as well as a contact number of the project manager or construction foreman for complaints/concerns.

4-24 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.

4-25 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. The local Indian community shall also be notified and consulted in the event any archaeological remains are uncovered. Archaeologist services shall be provided by the CITY at no cost to the CONTRACTOR.

4-26 SURVEY MONUMENTATION -- In the event that existing survey monumentation is found in the work zone during construction, the 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. Boundary Surveyor services shall be provided by the CITY at no cost to the CONTRACTOR.

The Contractor shall set three permanent control points. The control points shall be placed in concrete and the locations and disks will be provided by the City.

4-27 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 (\$500) 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.

4-28 LIFT STATION OPERATIONS DURING CONSTRUCTION – The CITY shall have access to the sewer lift station at all time during construction. Once construction activities impacting pumping or operations begin, the CONTRACTOR is responsible for the operation of the lift station. The CONTRACTOR shall not use any City owned equipment to perform bypass operations. Once work begins and Contractor has altered, adjusted, modified, or revised City equipment, the Contractor shall be responsible for operations of the lift station. Once bypass operations begin, the CONTRACTOR shall respond to all alarms at the sewer lift station through to completion of the project. The CONTRATOR shall notify City staff of all alarms that occur at the lift station.

4-29 STORM PUMP STATION OPERATIONS– The existing pump station building also houses a storm pump station. The storm pump station shall be operational at all times. Any temporary power supply to the pump station building shall also be capable of operating the storm pumps. No work shall be done to the storm pump station controls, and shall be protected in place during construction.

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 _____.

ARTICLE 2. COMPLETION OF WORK

The WORK shall be completed to the satisfaction of CITY within ____ (____) 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 ____ Dollars (\$____) 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 than 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 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 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
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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

CONTRACTOR _____

City Manager

By _____
(CORPORATE SEAL)

ATTEST:

Attest: _____

City Clerk

Address for giving notices:

APPROVED AS TO FORM:

City Attorney

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)

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

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 MAINTENANCE BOND

SECTION VI

TECHNICAL SPECIFICATIONS

SECTION 01660

TESTING AND STARTUP

PART 1 - GENERAL

1.01 DESCRIPTION

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

1.02 DEFINITIONS

- A. Functional Checkout: Tests to demonstrate that installed equipment meet's manufacturer's installation, calibration, and adjustment requirements; electrical and control system requirements; and other requirements as specified.
- B. Performance Test: Clean water test of a unit process or group of unit processes to demonstrate that the system(s), including equipment, instrumentation, controls, electrical, and auxiliary components function to meet the requirements of the Contract Documents.
 - 1. Duration of Performance Test: Continuous, uninterrupted period of not less than 2 days
- C. Demonstration Period: Period of initial operation and shakedown after commissioning and startup of the facility or portion of a facility used to further demonstrate that the facility operation under actual loading conditions and to identify issues not readily apparent or discovered during previous testing.
 - 1. Duration of Demonstration Period: Continuous Period of not less than 10 days.

1.03 SUBMITTALS

- A. Startup and Testing Plans:
 - 1. Submit the following plans:
 - a. Functional Checkout Plan
 - b. Performance Test Plan
 - c. Demonstration Period Plan
 - 2. Describe all procedures and schedule for project testing, commissioning and startup.
 - 3. Once the Test Plans have been reviewed and accepted by the ENGINEER, the

CONTRACTOR shall produce checkout, alignment, adjustment and calibration sign-off forms for each item of equipment.

- a. The forms will be used in the field by the CONTRACTOR and the ENGINEER jointly to ensure that each item of electrical and mechanical equipment has been properly installed and tested.
4. Submit at least 60 days prior to beginning startup activities.
5. Provide testing plan with test logs for each item of equipment or each system to be tested.
6. Provide regular updates of testing and commissioning schedule. Submit on a weekly basis a 14 day look-ahead schedule at the time of testing.

B. Test Reports:

1. Submit reports of:
 - a. Functional Checkout
 - b. Performance Test
 - c. Demonstration Period
2. Results in a tabular format acceptable to the ENGINEER.
3. Submit certification of calibration of all instrumentation, including testing equipment before the Performance Test.

1.04 QUALITY ASSURANCE

A. Installation:

1. All mechanical and electrical equipment furnished under this contract shall be installed in conformity with the details shown and specified and to the manufacturer's requirements.
2. Should a manufacturer's installation requirements conflict with specific requirements of the contract documents, the CONTRACTOR shall bring the matter to the attention of the ENGINEER.
3. Any additional costs incurred arising out of changes authorized by the ENGINEER to accommodate manufacturer's installation requirements will not be considered extra work.
4. Any costs, or time, incurred by the CONTRACTOR through failure to timely notify the ENGINEER of a difference between contract documents and manufacturer's installation requirements shall be borne by the CONTRACTOR.

B. Testing:

1. General Requirements:
 - a. All materials, equipment, and work included in this contract shall be tested and inspected to insure compliance with the contract requirements.
 - b. Unless otherwise specified, all costs of testing, including temporary facilities and connections, shall be borne by the CONTRACTOR.
 - c. For the purpose of this section, equipment shall mean any mechanical, electrical, instrumentation, or other device with one or more moving parts or devices requiring an electrical, pneumatic or hydraulic connection. Installed tests for equipment, piping, structures, instrumentation, control, and electrical systems are also included in other Sections.
2. No tests specified herein shall be applied until the item to be tested has been inspected and approval by the ENGINEER has been given for the application of such tests.
3. Tests and inspections, unless otherwise specified or accepted, shall be in accordance with the recognized standards of the industry.
4. The form of evidence of satisfactory fulfillment of all test and inspection requirements shall be, at the discretion of the ENGINEER, either by tests and inspections carried out in the ENGINEER's presence or by certificates or reports of tests and inspections carried out by approved persons or organizations.
5. The CONTRACTOR shall provide and use forms which include all test information, including specified operational parameters, and which shall be acceptable in content to the ENGINEER.

1.05 TESTS AND INSPECTION

A. General:

1. All equipment shall be tested by the CONTRACTOR and the equipment manufacturers' representatives to the satisfaction of the ENGINEER before any facility is put into operation.
2. Tests shall be as specified herein and as recommended by the manufacturer to determine whether the equipment has been properly assembled, aligned, adjusted and connected.
3. Any changes, adjustments or replacements required to make the equipment operate as specified shall be carried out by the CONTRACTOR as part of the Work.

B. Procedures:

1. The procedures shall be divided into three distinct stages; Functional Checkout, Performance Tests, and Demonstration Period.
2. Testing procedures shall be designed to duplicate, as nearly as possible, all conditions of operation and shall be carefully selected to ensure that the equipment is not

damaged.

3. Failure to observe these procedures may result in the non-acceptance of the subject equipment in question.
- C. Test results shall be within the tolerances set forth in the detailed specification sections of the contract documents and any manufacturer's required specifications.
1. If no tolerances have been specified, test results shall conform to tolerances established by recognized industry practice.
 2. Where, in the case of an otherwise satisfactory installed test, any doubt, dispute, or difference should arise between the ENGINEER and the CONTRACTOR regarding the test results or the methods or equipment used in the performance of such test, then the ENGINEER may order the test to be repeated.
 3. If the repeat test, using such modified methods or equipment as the ENGINEER may require, substantially confirms the previous test, then all costs in connection with the repeat test will be paid by the CITY; otherwise the costs shall be borne by the CONTRACTOR.
 4. Where the results of any installed test fail to comply with the contract requirements for such test, then such repeat tests as may be necessary to achieve the contract requirements shall be made by and at the expense of the CONTRACTOR
- D. At a minimum the following test data shall be collected:
1. Operating voltages and amperages per phase.
 2. Motor inrush current.
 3. Operating pressures.
 4. Operating flows.
 5. Operating temperature.
 6. Analog inputs and outputs during test.
 7. Analytical instruments outputs during test.
 8. Alarm conditions.
- E. Records and Forms:
1. The CONTRACTOR shall provide signoff forms for all testing to be accomplished under this contract.
 2. Sign off forms shall be provided for each item of mechanical, electrical and instrumentation equipment provided or installed under this contract and shall contain

provisions for recording relevant performance data for original testing and not less than three retests.

3. Separate sections shall be provided to record values for the Functional Checkout, Performance Test, initials of representatives of the equipment manufacturers, the CONTRACTOR and the ENGINEER.
4. Upon completion of testing, the CONTRACTOR shall furnish the ENGINEER with the original of the sign off sheet for each equipment item.

1.06 FUNCTIONAL CHECKOUT

- A. The procedures shall incorporate all requirements of these specifications and shall proceed in a logical, step-wise sequence to ensure that all equipment has been properly serviced, aligned, connected, calibrated, and adjusted prior to operation.
- B. Functional Checkout procedures shall include, but not necessarily be limited to:
 1. Electrical system testing.
 2. Instrumentation and controls testing.
 3. Piping system pressure testing and cleaning.
 4. Alignment of equipment.
 5. Initial lubrication of equipment.
 6. Cleaning of tanks, channels, basins, and all structures.
 7. Written certification by the manufacturer that the equipment has been installed in accordance with the manufacturer's instructions, requirements and recommendations; that the equipment is ready for operation and that the CITY's staff is suitably instructed in operation and maintenance of the equipment.

1.07 MANUFACTURER'S FIELD SERVICES AND CERTIFICATION

- A. Field Services:
 1. The manufacturer shall perform field services on each equipment item.
 2. Inspect system before initial start-up and certify that system has been correctly installed and prepared for start-up.
 3. After the installation of the units and all appurtenances, each unit shall be subjected to a field running test under actual operating conditions. The field tests shall be made by the CONTRACTOR in the presence of and as directed by the ENGINEER. The field tests shall demonstrate that under all conditions of operation, each unit:
 - a. Has not been damaged by transportation or installation

- b. Has been properly installed
 - c. Has no mechanical defects
 - d. Is in proper alignment
 - e. Has been properly connected
 - f. Is free of overheating of any parts
 - g. Is free of all objectionable vibration
 - h. Is free of excessive noise
 - i. Is free of overloading of any parts
 - j. Shall operate as specified with the control system
 - k. Meets the performance requirements indicated
4. Any defects in the equipment or failure to meet the requirements of the Specifications shall be promptly corrected by the CONTRACTOR.

B. Manufacturer's Certification:

1. The CONTRACTOR shall submit certification letters for all equipment per requirements of Contract Documents.
2. Each letter shall be submitted on the manufacturer's letterhead and shall include the following statements that:
 - a. The signer has visited the site, inspected the equipment and installation, and certifies that the equipment is ready for operation.
 - b. The equipment has been installed in accordance with the manufacturer's requirements and is properly aligned and ready for operation.
 - c. The equipment has been serviced, lubricated and properly prepared to perform in accordance with the intent of the Contract Documents.
 - d. The controls, protective devices, instrumentation, and control panels furnished, as part of the equipment package, are properly installed, calibrated, and are ready for full time operation.
 - e. The control logic for startup, shutdown, sequencing, interlocks, remote operation, and emergency shutdown have been tested and are functioning properly.
 - f. The training of the CITY's operations and maintenance personnel has been completed and note the date and time of that training.
 - g. The manufacturer certifies that the equipment is approved for operation.

1.08 PERFORMANCE TEST

A. Performance Test Requirements:

1. The Performance Test shall demonstrate the entire process system including, piping, valves, gates, controls, instrumentation, and auxiliary systems function as intended.
2. All systems and components shall be operated as a complete facility at various flow conditions, as directed by the ENGINEER.
3. All equipment and systems shall be operated, to the greatest extent practicable, at conditions which represent the full range of operating parameters as defined by the

Contract Documents.

4. The equipment shall be operated to determine equipment operating characteristics, including temperatures and vibration; to observe performance characteristics; and to permit initial adjustment of operating controls.
5. Performance Test shall include remote PLC modes of operation, alarms, and shutdowns as required in the electrical, instrumentation and controls portions of the Contract Documents.
6. Install gratings, safety chains, handrails, shaft guards, walkways and sidewalks prior to Performance Test.
7. Install all required lighting, heating, ventilation, and air conditioning for areas and processes to be included in the Performance Test.

B. Performance Test Sequencing:

1. After completion of Functional Checkout and Manufacturer's Certification.
2. CONTRACTOR shall schedule and notify the CITY 14 days prior to the start date of the performance Test.
3. CONTRACTOR shall inspect and clean debris and dirt from all piping and structures.
4. CONTRACTOR shall fill all process units and liquid process systems, except those employing oil or chemicals, with either potable or recycled water, as directed by the CITY.
 - a. Unless otherwise specified, the CONTRACTOR shall provide at no expense to the CITY, all power, fuel, water, utilities, supplies, consumables, chemicals, testing media, labor and all other necessary items and work required to complete all tests specified in this section.
 - b. Coordinate with CITY's personnel for supply of test water.
 - c. Cost for testing water shall be per the Contract Documents.
 - d. All fuel and oil systems shall be filled with the specified fluid.
 - e. Test media for chemical systems shall be either the intended fluid or compatible substitute, as directed by the ENGINEER.
 - f. Disposal methods for test media shall be subject to review by the ENGINEER.
 - g. CONTRACTOR shall be responsible for costs for disposal of test media.
5. Upon completion of the filling operations, the CONTRACTOR shall circulate potable or recycled water, as designated by the CITY, through the completed facility for the duration of the Performance Test.
 - a. CONTRACTOR shall provide temporary pumping or piping required to recirculate water through the process units.
 - b. Remove temporary facilities after the completion of Performance Testing.

C. Performance Test Criteria

1. Should the Performance Test period be halted for any reason related to the facilities constructed or the equipment furnished under this contract, or the CONTRACTOR's temporary testing systems, the Performance Test program shall be repeated until the specified continuous period has been accomplished without interruption.
2. If, under test, any portion of the work should fail to fulfill the contract requirements and is adjusted, altered, renewed or replaced; tests on that portion when so adjusted, altered, removed or replaced, together with all other portions of the work as are affected thereby, shall, if so required by the ENGINEER, be repeated within reasonable time and in accordance with the specified conditions.
 - a. The CONTRACTOR shall pay to the CITY all reasonable expenses incurred by the CITY as a result of repeating such tests.
3. At the conclusion of the Performance Test, the CONTRACTOR shall recheck all equipment for proper alignment, and if necessary, realign the equipment to manufacturer's standards or Contract requirements.
 - a. All equipment shall be checked for loose connections, unusual movement or other indications of improper operating characteristics.
 - b. Any deficiencies shall be corrected to the satisfaction of the ENGINEER.
 - c. All equipment or devices which exhibit unusual or unacceptable operating characteristics shall be disassembled and inspected.
 - d. Unacceptable equipment shall then be repaired or removed from the site and replaced at no cost to the CITY.

1.09 DEMONSTRATION PERIOD

A. General:

1. CITY personnel will operate the facility with the assistance and coordination from the CONTRACTOR.
2. Demonstration Period shall commence when, in the opinion of the ENGINEER, the following conditions have been met:
 - a. All equipment Functional Checkouts are complete.
 - b. Performance Testing is complete,
 - c. All Operations and Maintenance Manuals have been submitted, approved and copies have been transmitted to the CITY's operations staff.
 - d. All Operations & Maintenance training is complete.
 - e. All Manufacturer Certifications have been submitted.
3. CONTRACTOR shall schedule and notify the CITY 14 days prior to the start date of the Demonstration Period. CONTRACTOR shall schedule process cut-overs or tie-ins with the ENGINEER and CITY's operations staff.
4. CONTRACTOR shall make available its personnel, subcontractors, suppliers, and manufacturers' representatives for the entire Demonstration Period.

- a. CONTRACTOR personnel shall be onsite during normal working hours for the entire period to make necessary corrections and adjustments.
 - b. CONTRACTOR's electricians or electrical subcontractor shall be onsite during normal working hours for the entire period to make necessary corrections and adjustments.
 - c. SCADA and controls integrator shall be available to be onsite within 48 hours during the entire period to make corrections, modifications, and updates to the control system.
 - d. All other subcontractors, suppliers and manufacturer's representatives shall be available to be onsite within 48 hours during the entire period to make necessary corrections and adjustments ..
5. CONTRACTOR shall provide emergency contact numbers to be available 24 hours/day during the Demonstration Period.
- B. CITY shall furnish:
1. Operations staff to operate the facility with support of CONTRACTOR.
 2. Labor and materials required for laboratory testing.
- C. At the end of the Demonstration Period, the CITY may issue a Substantial Completion Certificate, if in the opinion of the ENGINEER, the following conditions have been met:
1. Corrections or adjustment to the facility as required by the CITY or ENGINEER to assure a reliable and completely operational facility have been made.
 2. Test reports have been submitted, reviewed, and accepted as adequate.
 3. All other Contract requirements for Substantial Completion have been fulfilled by the CONTRACTOR to the satisfaction of the CITY and ENGINEER.

PART 2 - PRODUCTS

2.01 Materials

- A. Gages, Meters, Recorders and Monitors:
1. Gages, meters, recorders and monitors shall be provided by the CONTRACTOR as required to supplement or augment the instrumentation system provided under this contract to properly demonstrate that all equipment fully satisfies the requirements of the contract documents.
 2. All devices employed for the purpose of measuring the performance of the facility's equipment and systems shall be specifically selected to provide a level of certainty consistent with the variables to be monitored.
 3. All instruments shall be recently calibrated, and the CONTRACTOR shall be prepared

at all times to demonstrate, through recalibration, the certainty of all instruments employed for testing purposes.

4. Calibration procedures shall in accordance with applicable standards of ASTM, ISA and IEEE.
5. The adequacy of all gages, meters, recorders and monitors shall be subject to review of the ENGINEER.

PART 3 - EXECUTION

3.01 Preparation

- A. Inspect and clean the equipment, connected piping and structures and remove debris and foreign material.
 1. Flush piping. Sweep or vacuum clean all channels and structures to remove fine material.
- B. Turn rotating equipment by hand to check for binding or other improper operation.
- C. Perform cold and hot alignment to the manufacturer's recommended tolerances.
- D. Remove rust preventatives, oils or temporary protective coatings used to protect the equipment during construction.
- E. Open and close adjacent valves by hand to check for proper seating and range of motion.
- F. Electrical systems:
 1. Complete insulation resistance tests on wiring.
 2. Perform grounding tests as required.
 3. Complete motor insulation resistance tests.
 4. Verify correct rotation of motors and equipment.
 5. Complete other requirements per electrical specifications.
- G. Instrumentation systems:
 1. Complete instrument calibration.
 2. Complete instrument loop tests.
 3. Test pneumatic systems for leaks.
 4. Verify all control signals, operation, ranges and settings.

5. Complete other requirements per instrumentation and controls specifications.

3.02 INSTALLATION

- A. All materials and equipment shall be installed by specialists properly skilled in the trades and professions required to assure first-class workmanship.
- B. Where required by detailed specifications, the CONTRACTOR shall cause the installation of specific equipment items to be accomplished under the supervision of factory-trained installation specialists furnished by the equipment manufacturers.
- C. The CONTRACTOR shall be prepared to document the skills and training of all workers engaged in the installation of all equipment furnished either by the CONTRACTOR or the CITY.

3.03 TESTING

- A. Testing shall proceed on a step-by-step basis in accordance with the CONTRACTOR's written testing procedures.
- B. The CONTRACTOR's testing work shall be accomplished by a skilled team of specialists under the direction of a coordinator whose sole responsibility shall be the orderly, systematic testing of all equipment, systems, structures and the complete facility as a unit.
- C. Each individual step in the procedures shall be witnessed by the ENGINEER.

END OF SECTION

SECTION 02050

DEMOLITION

PART 1 - GENERAL

1.01 DESCRIPTION

The Contractor shall remove equipment and concrete work as necessary for the construction of work as shown on the plans and as specified.

1.02 SAFETY

The Contractor shall take all necessary precautions with regard to safety in carrying out the demolition work. Suitable barriers shall be erected around the demolition area to protect workmen and the public, and the Contractor shall rigorously comply with applicable safety requirements.

1.03 PAYMENT

The cost of all demolition, salvage, abandonment and disposal of materials and debris shall be included in the bid price for pump station construction or in the bid items therefor and no additional compensation will be allowed.

PART 2 - EXECUTION

2.01 SALVAGE OF EQUIPMENT AND MATERIALS

The Contractor shall salvage the items identified by City staff and deliver them to the City for storage at a location to be defined by the City staff.

All electrical and mechanical equipment and all piping selected by the City for salvage shall be delivered to the City's designated yard. All other materials and debris resulting from the demolition work shall become the sole property of the Contractor and shall be disposed of by the Contractor at a legal disposal site. The Contractor shall take care to deliver all salvaged equipment to the City in good condition. The Contractor shall give the City two (2) working days to remove sensitive electrical equipment.

2.02 METHODS AND EQUIPMENT

Before starting work, the Contractor shall inform the City fully as to the method of demolition he proposes to follow, and the amount and character of equipment he proposes to use, which shall be subject to the approval of the City. The approval of the City shall not be considered as relieving the Contractor of the responsibility for the safety of his method or equipment or from carrying out the work in full accordance with the plans and specifications.

2.03 REMOVAL OF OLD STRUCTURES

The Contractor shall carefully dismantle old structures so as to minimize damage to nearby landscaping or improvements to remain.

2.04 DISPOSAL OF MATERIALS AND DEBRIS

All materials and debris resulting from the demolition work shall become the sole property of the Contractor and shall be disposed of by the Contractor at a legal disposal site.

END OF SECTION

SECTION 02100
SITE PREPARATION

PART 1 - GENERAL

1.01 SUMMARY

- A. The Work of this Section includes all those measures required during the CONTRACTOR's initial move onto the site to protect existing fences, buildings, and associated improvements, and utilities adjacent to the construction areas from damage due to boulders, trees or other objects dislodged during the construction process; clearing, grubbing and stripping.
- B. Site preparation shall not damage existing structures or cause obstruction and/or contamination to the property. The CONTRACTOR shall repair or replace any damaged property at no cost to the CITY.

1.02 SUBMITTALS

- A. Submittals shall be provided to confirm that materials to be used comply with information specified herein.
- B. The CONTRACTOR shall submit to the ENGINEER a schedule of proposed disposal locations and written authorization from disposal site owner.
- C. The CONTRACTOR shall submit safety measure drawings.

PART 2 - PRODUCTS

2.01 SAFETY BARRIERS

- A. The proximity of existing structures will require construction of appropriate safety barriers such as temporary fencing, or similar facilities. To minimize disturbance of existing roads and facilities, safety barriers shall allow for normal maintenance and operation of existing facilities and roads as determined by the ENGINEER. The CONTRACTOR shall prepare a submittal to the ENGINEER with drawings that define the proposed safety measures prior to any construction activity.
- B. All work shall be done in conformance with the rules and regulations pertaining to safety established by California Division of Industrial Safety and OSHA.

PART 3 - EXECUTION

3.01 CLEARING, GRUBBING AND STRIPPING

- A. All construction areas shall be cleared of structures, concrete or masonry debris, landscaping, trees, logs, upturned stumps, grass, weeds, loose boulders, and any other objectionable material of any kind which would interfere with the performance or

completion of the Work, create a hazard to safety, or impair the Work's subsequent usefulness or obstruct its operation. Trees and other natural vegetation outside the actual lines of construction shall be protected from damage during construction.

- B. Within the limits of clearing, the areas below the natural ground surface shall be grubbed to a depth necessary to remove all stumps, roots, buried logs, and all other objectionable material. Cleanouts and connection lines and any other underground structures, debris or waste shall be totally removed if they are found on the site. All objectionable material from the clearing and grubbing process shall be removed from the site and wasted.
- C. Additional requirements for excavating or removing existing facilities and soil are shown on the Drawings.

3.02 REGRADING

- A. In areas to receive fill, the stripped surface should be scarified to a depth of about 6 inches below the excavated level, conditioned to near optimum moisture content and recompacted to 90 percent of maximum density.
- B. Any holes remaining after stripping and grubbing shall be backfilled unless they are located within an area designated for further excavation. Backfill material and placement shall be in accordance with Section 02200.

3.03 DISPOSAL OF DEBRIS

- A. Dispose of removed materials, waste, trash, and debris in a safe, acceptable manner, in accordance with applicable laws and ordinances and as prescribed by authorities having jurisdiction.
- B. Burying of trash and debris on the site will not be permitted. Burning of trash and debris at the site will not be permitted.
- C. Remove trash and debris from the site daily so that its presence will not delay the progress of the Work.
- D. Removed materials, trash, and debris shall become the property of the CONTRACTOR and shall be removed from the CITY's property and disposed of in a legal manner. Location of disposal site and length of haul shall be the CONTRACTOR's responsibility.

3.04 UTILITY INTERFERENCE

- A. If an existing utility not indicated on the drawings is encountered that interferes with the work, the CONTRACTOR shall notify the ENGINEER.

3.05 RELOCATION AND REPLACEMENT

- A. Where existing items interfere with the work and require relocation and/or replacement, the work shall replace or relocate the items to at least their original condition.

END OF SECTION

SECTION 02200

EXCAVATION AND BACKFILL

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE OF WORK

The Contractor shall perform all operations necessary to excavate whatever substance encountered, including earth, sand, gravel, rock, buried structures, pipes or debris, to the depth shown on the plans and required for the installation, to remove unsuitable material and replace with suitable material for bedding and backfill, and to restore the ground surface or pavement to conditions satisfactory to the Engineer.

B. RELATED WORK SPECIFIED IN OTHER TECHNICAL SECTIONS

1. Cast in Place Concrete: Section 03310

1.02 DEFINITIONS

A. PIPE BEDDING

Pipe bedding shall be composed of that portion of the backfill material placed in the bottom of the trench for the pipe barrel to rest on.

B. PIPE ZONE BACKFILL

Pipe zone backfill shall comprise that portion of the backfill surrounding the installed pipe, extending after compaction from the foundation to a level twelve (12) inches above the top of the pipe.

C. INTERMEDIATE BACKFILL

Intermediate backfill shall comprise the portion of the backfill from twelve (12) inches above the top of the pipe to the surface.

D. SOUND EARTH

Sound earth shall mean most native soils, with the exception of highly organic spongy soils and fat, highly plastic expansive clays.

E. SOUND GRANULAR SOIL

Sand with a maximum particle size of 3-inch, or gravel with a minimum grain size of 3-inch, or pea gravel, or crushed rock mixed with sand shall comprise sound granular soil.

F. RELATIVE COMPACTION

Relative compaction shall be taken to mean field density values expressed as a percentage of the laboratory standard maximum density, as determined by the methods of ASTM D-1557-91 and D-1556-90 or ASTM D-2292-91 and D-3017-88 (Nuclear Method).

1.03 QUALITY ASSURANCE

The City will retain a Soils Engineer who will conduct compaction tests to determine compliance with soil compaction requirements as described herein above.

1.04 SUBMITTALS

- A. The Contractor shall submit to the Engineer copies of his/her proposed methods of sheeting, shoring and bracing as approved by the Division of Industrial Safety, per these specifications.
- B. The Contractor shall submit a sieve analysis of the materials proposed to be used as pipe bedding and backfill. When requested by the Engineer, the Contractor shall submit to the Engineer samples of all materials proposed for use used at no cost to the City.

1.05 BRACING AND SHEATHING

- A. The Contractor shall do and be solely responsible for all bracing, sheathing and shoring necessary to perform and protect all excavations as required for reasons of safety and to conform to governing laws. Where required by the Division of Industrial Safety, shoring shall be designed by a registered Civil Engineer. Excavations shall be supported so that the ground alongside the excavations will not slide, and all existing improvements, either on public or private property, will be fully protected from damage. Additional supports requested by the Engineer shall in no way relieve the Contractor of his/her responsibility for the sufficiency of his/her precautions.
- B. All shoring, bracing and sheathing above the top of the pipe shall be removed from the trench or excavation. Sheathing which has been driven below the invert of the pipe must not be removed. Under wet soil conditions, sheathing shall be left in the trench up to the top of the pipe.
- C. The cost of such bracing, shoring and sheathing shall be included in the price for shoring and no additional allowance will be made therefor.

1.06 CONTROL OF WATER

- A. The Contractor shall remove all water which may accumulate in the excavation during the progress of the work by pumping or other suitable methods so that all work can be done in the dry. Trenches and other excavations shall be kept free of water while the pipe or structures are being installed, while concrete is setting, and until backfill has progressed to a sufficient height to anchor the work against possible flotation or leakage. Water shall be disposed of in such a manner as to cause no injury to public or private property or be a menace to the public health.

- B. Where water is encountered, the trench excavation shall be carried twelve (12) inches below the pipe invert in which case the pipe bedding material shall be one and one half inch (1½") crushed rock.
- C. The cost of such removal of water and additional excavation and pipe bedding material shall be included in the lump sum bid price and no additional allowance will be made therefor.

1.07 REMOVAL OF UNSTABLE MATERIAL

- A. Where unstable soil is encountered or where the bearing capacity is unsatisfactory to the Engineer, the soil shall be removed to a depth of twelve (12) inches below the pipe barrel and replaced with one and one half inch (1½") crushed rock.
- B. The Contractor shall not be relieved thereby of his/her responsibility otherwise to employ procedures necessary to keep the trench bottom in a workable condition and provide a firm and adequate bedding for the pipe.
- C. The cost of trench stabilization shall be included in the price per lineal foot of pipeline and no additional payment will be allowed.

1.08 PAYMENT

The cost of excavation, removal of unstable material, excavation of rock, backfilling, dewatering, compacting, imported material, backfill and compaction shall be included in the bid price for construction and no additional allowance will be made therefor.

PART 2 - PRODUCTS

2.01 MATERIALS

A. GENERAL

The Contractor shall provide and install all materials as shown on the drawings and/or as specified herein.

B. CRUSHED ROCK

1. Crushed rock shall be hard, sound and durable and shall not slake or disintegrate in water.
2. One and one half inch (1½") crushed rock shall be uniformly graded with one hundred percent (100%) passing a one and one half inch (1½") sieve and not more than five percent (5%) passing a 3/8" sieve.
3. Three-quarter inch (¾") crushed rock shall be uniformly graded with one hundred percent (100%) passing a three-quarter inch (¾") sieve and not more than five percent (5%) passing a ¼" sieve.

C. CLASS 2 AGGREGATE BASE

Class 2 aggregate base shall be free from organic matter and other deleterious substances and shall be of such nature that it can be compacted readily with water and rolling to form a firm stable base. All class 2 aggregate base shall be virgin material with a sand equivalent of 25 and shall have the following gradation:

Sieve Size	Percentage passing
1"	100%
3/4"	87-100
No. 4	30-65
No 30	5-35
No. 200	0-12

D. LIGHTWEIGHT FILL AND LIGHTWEIGHT BASE ROCK – NOT USED

E. CONTROLLED DENSITY (ALSO INDICATED ON PLANS AS CDF)

Controlled Density Fill (CDF) shall be used where shown on the plans for backfill around new drainage pipes and structures.

CDF shall be flowable to fill the voids and self-leveling within the area to be backfilled. CDF shall have a cement content of 94 lbs per cubic yard and a total cementitious (cement and flyash) content of 200 to 250 lbs per cubic yard with a maximum aggregate size of 3/8-inch not to exceed 40% of the total aggregate content. Materials used for CDF shall have the following quantities:

1. Cement shall conform to ASTM C-150, Type II. The maximum percent alkalis shall not exceed 0.6%.
2. Aggregates shall comply with ASTM C-33 and shall be free from any substances that will react with the cement alkalis. The 3/8-inch aggregates shall be pea gravel.
3. Flyash shall conform to ASTM C 618 for Class F Pozzolans as modified herewith, and a loss on ignition (LOI) not to exceed 4%.
4. Water to be used in concrete shall be clean and free from objectionable quantities of organic matter, alkali, salts and other impurities which might reduce the strength, durability or otherwise adversely affect the quality of the CDF.
5. Air entraining agent shall conform ASTM C-260. Entrained air content shall be a minimum of 8.0%. The actual entrained air content shall be established for each particular job with the materials and aggregates to be used to meet the placing and unit weight requirements. Entrained air content may be as high as 20% for fluidity requirements.

F. TOPSOIL

Topsoil shall be imported, fertile, friable, natural, productive soil containing a normal amount of humus and capable of sustaining healthy plant life. Topsoil shall be free of subsoil, heavy of stiff clay, rocks, gravel, brush, roots, weeds, noxious seeds, sticks, trash and other deleterious substances. Soil shall not be infested with nematodes or with other noxious animal life or toxic substances. Soil shall be obtained from well-drained, arable land and shall be of an even texture. Soil shall not be taken from areas on which are growing any noxious weeds, such as Morning Glory, Sorrel, or Bermuda Grass.

G. WATER

Water used for dust control and moisture conditions for compaction shall be reasonably free of objectionable quantities of silt, oil, organic matter, alkali, salts and other impurities as determined by the Engineer. Bay water or water from drainage ditches on the project site shall not be used. Treated and disinfected effluent from the City treatment plant may be used for these purposes providing all water trucks or pipelines are clearly marked with signs stating, "WASTEWATER - DO NOT DRINK." All use of reclaimed wastewater must conform to Health Department Requirements.

PART 3 - EXECUTION

3.01 EXCAVATION

- A. The excavation shall be made to enable the pipe to be laid to the grades and alignment shown on the plans. Excavated materials not required for fill or backfill shall be removed from the site of the work.
- B. Trenches shall be excavated either by hand or by machine beginning at the outlet structure and proceeding upgrade, except as may otherwise be permitted by the Engineer. Hand excavation, tunneling, jacking or boring will be required when use of a machine will cause unnecessary destruction of trees, shrubs, lawns and existing structures above or below ground.
- C. The narrowest practicable trench width which will allow proper densification of pipe zone backfill materials shall be maintained with vertical sidewalls from the foundation to at least the top of the pipe. Trench width at the top of the pipe shall not exceed the maximum trench width shown in the County Specifications. Where general conditions make this impractical, means must be provided, with the approval of the Engineer, for adequately supporting the increased load on the pipe which such widening will cause.
- D. Where sheathing is required, the width of trench shall be increased sufficiently to accommodate the sheathing and timbers.
- E. Excavation for manholes and other structures shall have twelve (12) inch minimum and twenty four (24) inch maximum clearance on all sides. Bell holes shall be excavated accurately to size by hand.
- F. Excavation shall not be carried below the required level. Excess excavation below the required level shall be backfilled at the Contractor's expense with gravel, crushed rock or concrete, as directed by the Engineer, and thoroughly tamped.

- G. In rock, excavation shall be carried six (6) inches below the bottom of the pipe and replaced with an approved material thoroughly tamped to provide a uniform support for the pipe. Permits for blasting shall be secured by the Contractor from the proper authorities. The cost of drilling and blasting shall be included in the unit bid price for lineal foot of pipeline and no additional allowance will be made therefor.
- H. The bottom of all trenches shall be excavated accurately to the required grade with a firm bed to fit the barrel of the pipe. Minor adjustments in elevation required to produce the required invert slope shall be made by adequately bedding the pipe with sound granular pipe bedding materials, as hereinbefore defined, thoroughly compacted along the length of the pipe, underneath, and on both sides. It is essential that a uniform solid bearing be provided under the entire section of pipe.
- I. For flexible pipe (PVC and polyethylene pipe), the pipe bedding (bottom of trench) shall be firm, but not hard, and shall consist of pipe zone backfill, free from stones or lumps exceeding one (1) inch in greatest dimension which might bear against the pipe. Suitable foundations shall be prepared by providing a one (1) inch minimum leveling course with loose bedding material graded uniformly in one plane for the full length of the pipe. Foundations shall provide uniform support under the haunches of the pipe up to the spring line along the full length of each pipe section.

3.02 ROCK EXCAVATION

Hard rock shall be defined as rock excavation at a production rate of less than 5 cubic yards per hour using a moderate to large sized hydraulic excavator (net power of at least 180 hp and minimum operating weight of 80,000 lbs) operating at full power with carbide tipped rock teeth on $\frac{3}{4}$ -yard bucket. Any rock conditions encountered to be claimed as hard rock need to be observed and approved in the field by the Engineer prior to being accepted as hard rock.

3.03 BACKFILL

A. GENERAL

1. After the concrete and the pipelines and their appurtenances have been properly constructed and inspected and after joints, plaster and concrete have set sufficiently to prevent damage, backfilling shall be done with approved material free from large clods or stones. Unless otherwise specified all backfill shall be Class 2 aggregate base compacted to 90 percent relative compaction per ASTM 1557.
2. The Contractor's attention is called to the fact that it will be his/her responsibility to obtain an encroachment permit for all work to be done in streets, roads, highways or railroad rights-of-way from the proper City having jurisdiction and that the method of backfilling of trenches must conform to the requirements of such City. Where imported materials will be required, the cost of furnishing and placing such materials shall be included in his/her bid price for sewer construction and no additional allowance will be made therefor.

B. PIPE ZONE BACKFILL

1. Backfill materials shall be so placed that the pipe will not be displaced, excessively deflected, or damaged. Materials placed as pipe zone backfill shall be free of stones or lumps exceeding one (1) inch in greatest dimension and shall be so placed as to prevent the formation of voids.
2. Pipe zone backfill preparation shall be placed and compacted determined on the basis of local native soil conditions and such that vertical ring deflection of flexible pipe will be limited to five percent (5%) of the nominal pipe diameter.
3. In general, pipe zone backfill shall be placed immediately after laying the pipe, provided the pipe is true to line and grade.

C. INTERMEDIATE BACKFILL

1. The backfill shall be blended sufficiently to secure the best practicable degree of compaction and stability.
2. Compaction may be performed by mechanical or hand tamping methods or by hydraulic methods as is necessary to achieve the required relative compaction.
3. Care shall be taken during compaction to prevent displacement of the pipe due to floating or shifting and to prevent hydrostatic or impact damage to the pipe and foundation. Heavy mechanical tamping or rolling equipment directly over the top of the pipe, such as might result in excessive reduction of the vertical diameter of the installed pipe, shall be avoided.
4. Intermediate backfill above the pipe zone backfill shall not be placed until conformance with specified relative compaction of pipe zone backfill material has been confirmed.

3.04 PRECAUTION AGAINST FLOTATION

The Contractor shall take every precaution against the flotation of the pipe due to water entering the trench or while pouring concrete encasement. In case of flotation, the Contractor shall replace the pipeline or portions thereof at his/her own expense and make good any injury or damage that may have resulted.

3.05 BACKFILL DEFECTS

Within one (1) year after acceptance of the project, the Contractor shall promptly refill and repair all trenches which settle or otherwise show defects. All shrubs, trees, lawns, patios, structures and other property disturbed during the course of the work shall be restored to their original condition to the satisfaction of the Engineer.

END OF SECTION

SECTION 03310

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SCOPE OF WORK

The work included under this section consists of furnishing all labor, tools, equipment and materials necessary for the installation of all concrete, reinforced concrete, reinforcing steel, grout and mortar, as shown on the plans and specified herein. Concrete for concrete pavement shall conform to these specifications.

1.02 QUALITY ASSURANCE, MATERIALS AND CONSTRUCTION

A. GENERAL

All concrete materials and construction shall comply with the requirements, and be in accordance with the American Concrete Institute Standard 301-89, "Specifications for Structural Concrete for Buildings," except as supplemented and modified as follows (all references to "Architect/Engineer" in the ACI Standard shall be interpreted as referring to the Engineer).

Additional workmanship and materials requirements shall conform to ACI 350R-89, "Environmental Engineering Concrete Structures." The Engineer shall interpret the applicability and intent of this section.

B. STRENGTH

1. The concrete for all structures shall have a minimum compressive strength of four thousand five hundred (4,500) pounds per square inch twenty-eight (28) days after placement.
2. All concrete shall contain a minimum of five hundred sixty-four pounds (six sacks) of Portland cement per cubic yard.

1.03 SUBMITTALS

Per these specifications, the Contractor shall submit to the Engineer for favorable review the following, even though items proposed to be furnished conform to the exact description stated in this section or as shown on the Contract Drawings:

1. A notarized statement stating that the cement conforms to ASTM C-150.
2. Shop Drawings of all reinforcing details and layout.
3. Concrete mix design and strength data.

1.04 PAYMENT

The cost of all cast-in-place concrete, including all materials, reinforcing, form work, finishing grout and epoxies shall be included in the bid price for the construction work and no additional compensation will be allowed.

PART 2 - PRODUCTS

2.01 GENERAL

All materials shall be furnished by an established and experienced manufacturer or supplier. All materials shall be new, shall be of first-class ingredients, and shall be guaranteed to perform the service required.

2.02 CONCRETE MATERIALS

A. CEMENT

All cement for all structures shall be Type II or Type V, ASTM C-150.

B. ADMIXTURES

1. An approved water-reducing admixture conforming to ASTM C-494 shall be added.
2. An approved air-entraining admixture conforming to ASTM C-260 shall be added. Total air content shall be between 4½ and 6½% as measured by ASTM C-173.
3. Other admixtures designed and manufactured for the express purpose of (1) preventing segregation of the mix and/or (2) improving the workability of the concrete will be permitted subject to written approval by the Engineer both for quality and proportions. Admixtures shall not be used to replace cement.
4. Unless specifically provided for in these Specifications, no other admixtures will be permitted.

C. AGGREGATES

1. All aggregates shall conform to "Specifications for Concrete Aggregates" (ASTM C-33). All aggregates shall have a minimum C.V. (cleanliness value) and S.E. (sand equivalent) of not less than 75. Three (3) samples shall be tested in each case and shall be taken from the weight hopper. The average of the results of the individual tests will be the accepted value in each case. These values shall be maintained throughout the course of the work, and any indicated deviation therefrom will be cause for rejection of such material, pending additional tests. Tests shall conform to Test Method No. Calif. 227 for Cleanliness Value for Coarse Aggregate and Test Method No. Calif. 217 for Sand Equivalent (California Transportation Laboratory, California Test Methods).
2. The nominal maximum size of aggregates shall be 1½"; gradation shall be based on a 1½" nominal maximum size aggregate. In thin section (6" or less in thickness), a

$\frac{3}{4}$ " nominal maximum size aggregate may be used if expressly approved in writing by the Engineer.

D. SELECTION OF PROPORTIONS

The Contractor shall have his/her mix designed and shall submit the proposed proportions to the Engineer for review and approval prior to the preparation of the trial batch. The cement content shall be not less than six (6) sacks of cement (94 lbs per sack) per cubic yard of concrete, and the water-cement ratio shall not exceed 0.45 or a total of 5.0 gallons of water per 94-lb sack of cement.

E. CHLORIDE LIMITATION

The maximum water soluble chloride ion content expressed as a percent of the cement contributed from all ingredients of the concrete mix, including water aggregates, cementitious material and admixtures, shall not exceed 0.10%.

2.03 REINFORCING STEEL

Reinforcing steel shall conform to ASTM A-615, Grade 60.

2.04 GROUT

Grout shall have a minimum cement content of 7 sacks per cubic yard, plus a water reducing agent, and shall have a compressive strength as required to exceed $f_c = 1500$ psi.

PART 3 - EXECUTION

3.01 FORMWORK

Lumber and plywood shall conform to the dimensions of the concrete surfaces shown on the Plans, shall be sufficiently tight to prevent leakage, and shall be sufficiently strong and braced to maintain their proper shape and alignment.

Earth cuts shall not be used as forms for vertical surfaces other than foundations below grade. Where permitted, the cut shall be neat, straight and must stand vertical.

3.02 REINFORCING

Reinforcing bars shall be tied and supported so as to maintain their exact shape and alignment during concrete placement. Lap bars 50 diameters at splices where permitted and not otherwise noted on the plans. Standard hook dimensions shall conform to ACI 318 code for standard hooks.

3.03 CONCRETE PLACEMENT

The Contractor shall notify the Engineer at least seventy-two (72) hours before concrete is placed, No concrete shall be placed until all excavations, forms, reinforcing and inserts have been constructed and observed by the Engineer.

All concrete shall be thoroughly vibrated during the pouring operation by a mechanical vibrator.

3.04 FINISHES ON CONCRETE

All surfaces shall be finished to flat true planes or smooth surfaces. Edges shall be straight or uniformly curved. Flat surfaces shall be accurate to within 1/8-inch in 10 feet. Unless otherwise designated on the plans, concrete finishes shall be as follows:

Walking surfaces - Light broom finish.

Exposed unpainted vertical surfaces - Smooth form finish plus sacking.

All tie holes and bug holes shall be filled with non-metallic, non-shrink grout per ACI 350R-89.

3.05 DRYPACK AND SPECIAL HIGH-STRENGTH NON-SHRINK MORTAR

Where "drypack" is called for on the Plans, a mixture containing one (1) part cement to three (3) parts clean sand shall be used. The moisture content shall be such that the mixture will ball when formed by hand, but will crumble when struck. The mixture shall be confined in the opening to be filled and driven home in small amounts, using a hammer and a stick or blunt metal tool in such a manner that a very dense mortar is obtained. Should the resulting joint leak, the material shall be chipped out and the opening refilled until a watertight joint is obtained.

Mortar used shall be non-shrinking, level-fill grout, water and oil resistant, developing a compressive strength of at least 7,500 psi in seven (7) days, non-metallic and bond to metal. Mortar shall be used in accordance with the recommendations of the manufacturer.

3.06 ALTERATIONS TO CONCRETE STRUCTURES

A. GENERAL

1. All alterations, chipping, drilling or cutting of concrete shall be approved by the Engineer.
2. Where the Contractor is required to cut openings through existing concrete or masonry walls, the hole shall be pre-cut with a proper masonry saw on both sides of the wall. After removal of the concrete, all rough surfaces of the wall shall be ground smooth and patched with cement mortar.
3. Openings for installation of pipes up to twelve (12) inches diameter shall be machine cored. For larger pipes, openings shall be made by drilling small holes around the periphery prior to chipping out the concrete. After the pipe has been installed, the opening shall be grouted and made completely watertight.

B. GROUT FOR ANCHOR BOLTS, MANHOLE STEPS AND OTHER EMBEDMENTS

Anchor bolts, manhole steps and other embedment shall be set in non-sag epoxy grout suitable for submerged service.

C. CONCRETE SURFACE REPAIRS

All honeycombed, spalled, cracked, pitted or crazed concrete surfaces shall be chipped out and repaired using "Mainstay ML-72" as manufactured by Madewell Products Corporation of Alpharetta, Georgia, or "Sikadur 224" as manufactured by Sika Corp, Santa Fe Springs, CA, or equal. The repairs shall be made in strict conformance with the manufacturer's recommendations. For smoothing or repairing large areas that require more than 3-inch thickness, special instructions on the use of the material shall be obtained from the manufacturer.

Where leaks occur in concrete walls, the concrete shall be chipped around the leak and sealed with cement grout above specified, in strict accordance with the manufacturer's instructions.

D. BONDING NEW CONCRETE TO OLD

Where it is required to apply new concrete over old surfaces or to bond precast concrete sections or other types of material to concrete, the Contractor shall first apply a brush-on epoxy resin concrete adhesive equivalent to BASF MasterEmaco ADH 327, or "Sikadur 32 Hi-Mod" as manufactured by Sika Corp, Santa Fe Springs, CA. The old surface shall be cleaned by sandblasting or chipping and the adhesive applied in strict accordance with the recommendations of the manufacturer.

3.07 TESTS OF CONCRETE

Slump tests shall be performed by the Contractor in the presence of the Inspector at the beginning of each day's pour and at such additional times as required by the Engineer or his/her representative. Slump tests shall be made in accordance with current ASTM Designation C-143.

The amount of water used in the mixture shall be the amount required to produce concrete with a 4" maximum slump. When the slump of the concrete is found to exceed the nominal slump, the mixture shall be adjusted as directed by the Engineer to reduce the slump to a value within the nominal range shown.

Where there are adverse or difficult conditions which affect the placing of concrete, the Contractor may request permission of the Engineer to increase the slump by increasing both the water and cement content. The cost of additional water and cement shall be at the Contractor's expense.

3.08 INSPECTION

The City shall inspect and approve formwork and reinforcing steel placement prior to concrete pours. The Contractor shall provide at least twenty-four (24) hours notice that inspections are required.

END OF SECTION

SECTION 04820

REINFORCED MASONRY UNIT ASSEMBLIES

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Concrete Block.
- B. Mortar and Grout.
- C. Reinforcement and Anchorage.

1.02 REFERENCES

- A. ACI 530/ASCE 5/TMS 402 - Building Code Requirements for Masonry Structures; American Concrete Institute International; 2002.
- B. ACI 530.1/ASCE 6/TMS 602 - Specification For Masonry Structures; American Concrete Institute International; 2002.
- C. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2001b.
- D. ASTM C 90 - Standard Specification for Loadbearing Concrete Masonry Units; 2002.
- E. ASTM C 94/C 94M - Standard Specification for Ready-Mixed Concrete; 2000.
- F. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar; 2002.
- G. ASTM C 150 - Standard Specification for Portland Cement; 2002a.
- H. ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes; 1991 (Reapproved 1997).
- I. ASTM C 270 - Standard Specification for Mortar for Unit Masonry; 2002.
- J. ASTM C 404 - Standard Specification for Aggregates for Masonry Grout; 1997.
- K. ASTM C 1019 - Standard Test Method for Sampling and Testing Grout; 2002.

1.03 SUBMITTALS

- A. See Section 01300 - Submittals, for submittal procedures.
- B. Product Data: Provide data for masonry units and mortar and grout.

- C. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

Comply with provisions of ACI 530/ASCE 5/TMS 402 and ACI 530.1/ASCE 6/TMS 602, except where exceeded by requirements of the contract documents.

1.05 DELIVERY, STORAGE, AND HANDLING

Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Maintain materials and surrounding air temperature to minimum 40 degrees F (5 degrees C) prior to, during, and 48 hours after completion of masonry work.
- B. Maintain materials and surrounding air temperature to maximum 90 degrees F (32 degrees C) prior to, during, and 48 hours after completion of masonry work.

1.07 PAYMENT

The cost of all reinforced masonry shall be included in the bid price for the construction work and no additional compensation will be allowed.

PART 2 - PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. Concrete Block - Comply with referenced standards and as follows:
 - 1. Size: Open End Bond Beam units with nominal face dimensions of 16 x 6 inches (400 x 200 mm) and nominal depth of 8 inches (200mm).
 - 2. Special Shapes: Provide non-standard blocks configured for corners, headers, and other detailed conditions.
 - 3. Load-Bearing Units: ASTM C 90, light weight, Hollow block Grade N, Type 1.

2.02 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type II; color as required to produce approved color sample.
 - 1. Hydrated Lime: ASTM C 207, Type S.
 - 2. Mortar Aggregate: ASTM C 144.
 - 3. Grout Aggregate: ASTM C 404.

4. Water: Clean and potable.

2.03 REINFORCEMENT AND ANCHORAGE

Reinforcing Steel: ASTM A 615/A 615M Grade 60 (420).

1. Deformed billet-steel bars.

2.04 MORTAR MIXES

Mortar for Unit Masonry: ASTM C 270, using the Proportion Specification.

1. Masonry below grade and in contact with earth: Type S.
2. Exterior, loadbearing masonry: Type N.

2.05 GROUT MIXES

Engineered Masonry: 2500 psi (17.3 MPa) strength at 28 days; 8-10 inches (200-250 mm) slump; provide premixed type in accordance with ASTM C 94/C 94M.

1. Fine grout for spaces with smallest horizontal dimension of 2 inches (50 mm) or less.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

- A. Clean reinforcement of loose rust.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.
- C. For areas where high-lift grouting will be employed, provide cleanout openings as follows:
 1. Hollow Masonry: Not less than 4 inches (100 mm) high at the bottom of each cell to be grouted, formed by cutting out face shell of masonry unit.

3.03 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:

1. Bond: Running.
2. Coursing: One unit and one mortar joint to equal 8 inches (200 mm).
3. Mortar Joints: Flush.

3.04 PLACING AND BONDING

- A. Lay hollow masonry units with face shell bedding on head and bed joints.
- B. Remove excess mortar as work progresses.
- C. Interlock intersections and external corners.
- D. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- E. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

3.05 REINFORCEMENT AND ANCHORAGE

Reinforcement Bars: Secure at locations indicated and to avoid displacement during grouting. Minimum spacing between bars or to masonry surfaces shall be one bar diameter.

1. Welding of splices is not permitted.

3.06 GROUTING

- A. Solid grout all cells. Perform grouting by means of high-lift technique, except in locations that mandate use of low-lift grouting technique.
- B. Low-Lift Grouting:
 1. Limit height of masonry to 16 inches (400 mm) above each pour.
 2. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.
 3. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.
- C. High-Lift Grouting:
 1. Verify that horizontal and vertical reinforcement is in proper position and adequately secured before beginning pours.

2. Clean out masonry cells and other cavities to be grouted by high pressure water spray or compressed air. Remove debris, allow to dry, and inspect before sealing cleanout openings.
3. Hollow Masonry: Limit lifts to maximum 4 feet (1.2 m) and pours to maximum height of 24 feet (7.3 m).
4. Place grout for spanning elements in single, continuous pour.

3.07 BUILT-IN WORK

- A. As work progresses, install built-in metal door frames and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.

3.08 TOLERANCES

- A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch (1.6 mm).
- B. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft (6 mm/3 m) and 1/2 inch in 20 ft (13 mm/6 m) or more.
- C. Maximum Variation from Plumb: 1/4 inch (6 mm) per story non-cumulative; 1/2 inch (13 mm) in two stories or more.
- D. Maximum Variation from Level Coursing: 1/8 inch in 3 ft (3 mm/m) and 1/4 inch in 10 ft (6 mm/3 m); 1/2 inch in 30 ft (13 mm/9 m).
- E. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft (3 mm/m).

3.09 FIELD QUALITY CONTROL

Contractor shall be responsible for maintaining field quality control.

3.10 PROTECTION OF FINISHED WORK

Without damaging completed work, provide protective boards at exposed external corners which are subject to damage by construction activities.

END OF SECTION

SECTION 05500
METAL FABRICATIONS

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE

Work shall include, but not necessarily be limited to, the following metal fabrications as shown on the drawings, as specified or required to complete the project:

1. Aluminum Access Covers
2. Aluminum Gratings
3. Aluminum Handrails
4. Bolts, Nuts and Washers
5. Stainless Steel
6. Castings

B. RELATED WORK SPECIFIED IN OTHER TECHNICAL SECTIONS

1. High Performance Coatings: Section 09960

1.02 QUALITY ASSURANCE

A. All fabricated items shall be crafted in a substantial and competent manner.

B. The Contractor shall comply with the following reference standards:

1. "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings," of American Institute of Steel Construction, latest edition.
2. "Code for Arch and Gas Welding in Building Construction," of the American Welding Society, AWS C 1.1, latest edition.
3. "Architectural Metals," published by National Association of Architectural Metal Manufacturers (NAAMM).
4. "Welding Aluminum," published by the American Welding Society (AWS), latest edition.

C. The Contractor shall comply with the following regulatory standards:

1. California Building Code (CBC), current edition.

2. Stair and Guardrail design requirements of OSHA and Cal/OSHA.

1.03 SUBMITTALS

The Contractor shall submit to the Engineer detailed drawings of the items specified herein for review before fabrication per these specifications.

1.04 PAYMENT

The cost of all metal work including materials and installation shall be included in various bid items and no additional compensation will be allowed.

PART 2 - PRODUCTS

2.01 ALUMINUM ACCESS HATCH COVERS

A. GENERAL

The schedule of hatch cover dimensions and loading requirements are shown on the plans.

B. TYPE AND MANUFACTURE

The Contractor shall furnish and install aluminum access hatch covers over the pump pit and valve pit as shown on the plans. Each access hatch cover shall be fitted with Type 316 stainless steel hinges, bolts, nuts and hardware, safety chains, inside handle, automatic hold-open device and covered recessed padlock hasps as shown on the plans. The clear opening dimensions specified on the plans shall be the dimensions of the hatch opening with the hinged safety grating open. The concrete opening will be larger to account for the thickness of the doors and safety grate. The access hatch cover frame to the pump pit shall be provided with sliding nut rails to allow detachment of the accessories required and heavy duty retaining clips for safety posts. All frames shall be provided with stainless steel hydraulic assist door opening. The required load ratings of the hatch covers are shown on the plans. Access hatch cover doors shall be of skid-proof design as manufactured by U.S. Foundry, Sycamore Castings or approved equal.

C. TYPE A HATCH COVER

Type A hatch covers shall have two leaves opening in the same direction.

D. TYPE B HATCH COVER

Type B hatch covers shall have one or more leaves opening in the same direction.

E. TYPE C HATCH COVER

Type C hatch covers shall have double door with opposing opening leaves.

F. SAFETY GRATE

A hinged safety grate shall be provided for each hatch. The grate shall be a one-piece molded fiberglass grating with load bearing bars in both directions designed to withstand

minimum live load of 300 pounds per square foot. Each grate shall be provided with a permanent hinging system, which will lock the grate in the 90 degree open position. Safety grate shall be supplied with a heavy duty pneu-spring for ease of operation when opening the grate. The hatch cover shall not be able to shut until the grate is closed--thereby insuring that the fall protection is in place when the next operator opens the hatch cover. The grate shall have an OSHA safety orange or safety yellow finish to increase visual awareness of the safety hazard.

G. NUT RAIL

Nut rails shall be provided on hatches over pump pits.

2.02 ALUMINUM GRATING (NOT USED)

2.03 ALUMINUM HANDRAILS (NOT USED)

2.04 BOLTS, NUTS AND WASHERS

All bolts, nuts and washers shall be Type 316 stainless steel.

2.05 STAINLESS STEEL

All stainless steel shall be Type 316.

2.06 CASTINGS (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL

- A. All metalwork specified herein shall be installed in a neat and competent manner and in true alignment.
- B. All galvanized metal railings, ladders and stairways shall be painted in accordance with the Section on "Painting." Aluminum products shall be left unpainted.

3.02 COATINGS

A. ALUMINUM ANODIZING

After fabrication, all aluminum railing posts shall be given a clear anodized (electro-chemical) finish conforming to NAAM NA-2A designation, to a thickness of 0.7 mils minimum anodized coating.

B. ISOLATION COATINGS

Aluminum pigmented asphalt paint shall be used for aluminum in contact with other metals or concrete surfaces.

END OF SECTION

SECTION 09960

HIGH PERFORMANCE COATINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes: Field-applied coatings.
- B. Related sections:
 - 1. Section 03310 – Cast-In-Place Concrete
 - 2. Section 15050 – Pipework

1.2 REFERENCES.

- A. ASTM International (ASTM):
 - 1. D 16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.
 - 2. D 4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
- B. International Concrete Repair Institute (ICRI):
 - 1. Guideline 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.
- C. NACE International (NACE):
 - 1. SP0178 - Design, Fabrication, and Surface Finish Practices for Tanks and Vessels to Be Lined for Immersion Service.
 - 2. SP0188 - Discontinuity (Holiday) Testing of Protective Coatings.
- D. National Association of Pipe Fabricators (NAPF):
 - 1. 500-03 - Surface Preparation Standard for Ductile Iron Pipe and Fittings Receiving Special External Coatings and/or Special Internal Linings.
- E. NSF International (NSF):
 - 1. 61 - Drinking Water System Components - Health Effects.
- F. Society for Protective Coatings (SSPC):
 - 1. SP COM - Surface Preparation Commentary for Steel and Concrete Substrates.
 - 2. SP 1 - Solvent Cleaning.
 - 3. SP 2 - Hand Tool Cleaning.
 - 4. SP 3 - Power Tool Cleaning.
 - 5. SP 5 - White Metal Blast Cleaning.
 - 6. SP 6 - Commercial Blast Cleaning.
 - 7. SP 7 - Brush-Off Blast Cleaning.
 - 8. SP 10 - Near-White Blast Cleaning.
 - 9. SP 13 - Surface Preparation of Concrete.

- G. United States Environmental Protection Agency (EPA):
 - 1. Method 24 - Surface Coatings.

1.3 DEFINITIONS

- A. Submerged metal: Steel or iron surfaces below tops of channel or structure walls that will contain water even when above expected water level.
- B. Submerged concrete and masonry surfaces: Surfaces that are or will be:
 - 1. Underwater.
 - 2. In structures that normally contain water.
 - 3. Below tops of walls of water-containing structures.
- C. Exposed surface: Any metal or concrete surface, indoors or outdoors, that is exposed to view.
- D. Dry film thickness (DFT): Thickness of fully cured coating, measured in mils.
- E. Volatile organic compound (VOC): Content of air polluting hydrocarbons in uncured coating product measured in units of grams per liter or pounds per gallon, as determined by EPA Method 24.
- F. Ferrous: Cast iron, ductile iron, wrought iron, and all steel alloys except stainless steel.
- G. Where SSPC surface preparation standards are specified or implied for ductile iron pipe or fittings, the equivalent NAPF surface preparation standard shall be substituted for the SSPC standard.

1.4 PERFORMANCE REQUIREMENTS

- A. Coating materials shall be especially adapted for use in wastewater facilities.
- B. Coating materials used in contact with potable water supply systems shall be certified to NSF 61.

1.5 SUBMITTALS

- A. General: Submit as specified within.
- B. Shop drawings:
 - 1. Schedule of proposed coating materials.
 - 2. Schedule of surfaces to be coated with each coating material.
- C. Product data: Include description of physical properties of coatings including solids content and ingredient analysis, VOC content, temperature resistance, typical exposures and limitations, and manufacturer's standard color chips:
 - 1. Regulatory requirements: Submit data concerning the following:
 - a. VOC limitations.
 - b. Coatings containing lead compounds and polychlorinated biphenyls.
 - c. Abrasives and abrasive blast cleaning techniques, and disposal.

- d. NSF certification of coatings for use in potable water supply systems.
- D. Samples: Include 8-inch square drawdowns or brush-outs of topcoat finish when requested. Identify each sample as to finish, formula, color name and number, sheen name, and gloss units.
- E. Certificates: Submit in accordance with requirements for Product Data.
- F. Manufacturer's instructions: Include the following:
 - 1. Special requirements for transportation and storage.
 - 2. Mixing instructions.
 - 3. Shelf life.
 - 4. Pot life of material.
 - 5. Precautions for applications free of defects.
 - 6. Surface preparation.
 - 7. Method of application.
 - 8. Recommended number of coats.
 - 9. Recommended DFT of each coat.
 - 10. Recommended total DFT.
 - 11. Drying time of each coat, including prime coat.
 - 12. Required prime coat.
 - 13. Compatible and non-compatible prime coats.
 - 14. Recommended thinners, when recommended.
 - 15. Limits of ambient conditions during and after application.
 - 16. Time allowed between coats (minimum and maximum).
 - 17. Required protection from sun, wind, and other conditions.
 - 18. Touch-up requirements and limitations.
 - 19. Minimum adhesion of each system submitted in accordance with ASTM D 4541.
 - 20. Material Safety Data Sheet.
- G. Manufacturer's Representative's Field Reports.
- H. Operations and Maintenance Data: Submit as specified:
 - 1. Reports on visits to project site to view and approve surface preparation of structures to be coated.
 - 2. Reports on visits to project site to observe and approve coating application procedures.
 - 3. Reports on visits to coating plants to observe and approve surface preparation and coating application on items that are "shop coated."
- I. Quality Assurance Submittals:
 - 1. Quality assurance plan.
 - 2. Qualifications of coating applicator including List of Similar Projects.
- J. Certifications:
 - 1. Submit notarized certificate that:
 - a. All paints and coatings to be used on this project comply with current federal, state, and local VOC regulations.
 - 2. California certifications:
 - a. All paints and coatings to be used on this project comply with the current

VOC regulations of the Bay Area Air Quality Management District.

1.6 QUALITY ASSURANCE

- A. Applicator qualifications:
 - 1. Minimum of 5 years of experience applying specified type or types of coatings under conditions similar to those of the Work:
 - a. Provide qualifications of applicator and references listing 5 similar projects completed in the past 2 years.
 - 2. Manufacturer-approved applicator when manufacturer has approved applicator program.
 - 3. Approved and licensed by polymorphic polyester resin manufacturer to apply polymorphic polyester resin coating system.
 - 4. Approved and licensed by elastomeric polyurethane (100-percent solids) manufacturer to apply 100-percent solids elastomeric polyurethane system.
 - 5. Applicator of off-site application of coal-tar epoxy shall have successfully applied coal-tar epoxy on similar surfaces in material, size, and complexity as on the Project.
- B. Regulatory requirements: Comply with governing agencies regulations by using coatings that do not exceed permissible VOC limits and do not contain lead:
 - 1. Do not use coal-tar epoxy in contact with drinking water or exposed to ultraviolet radiation.
- C. Certification: Certify that applicable pigments are resistant to discoloration or deterioration when exposed to hydrogen sulfide and other sewage gases and product data designates coating as suitable for wastewater service.
- D. Field samples:
 - 1. Prepare and coat a minimum 100-square-foot area between corners or limits such as control or construction joints of each system.
 - 2. Approved field sample may be part of the Work.
 - 3. Obtain approval before painting other surfaces.
- E. Compatibility of coatings: Use products by same manufacturer for prime coats, intermediate coats, and finish coats on same surface, unless specified otherwise.
- F. Services of coating manufacturer's representative: Arrange for coating manufacturer's representative to attend pre-installation conferences. Make periodic visits to the project site to provide consultation and inspection services during surface preparation and application of coatings, and to make visits to coating plants to observe and approve surface preparation procedures and coating application of items to be "shop-primed and coated."

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products as specified in Section 01600.
- B. Remove unspecified and unapproved paints from Project site immediately.

- C. Deliver new unopened containers with labels identifying the manufacturer's name, brand name, product type, batch number, date of manufacturer, expiration date or shelf life, color, and mixing and reducing instructions:
 1. Do not deliver materials aged more than 12 months from manufacturing date.
- D. Store coatings in well-ventilated facility that provides protection from the sun weather, and fire hazards. Maintain ambient storage temperature between 45 and 90 degrees Fahrenheit, unless otherwise recommended by the manufacturer.
- E. Take precautions to prevent fire and spontaneous combustion.

1.8 PROJECT CONDITIONS

- A. Surface moisture contents: Do not coat surfaces that exceed manufacturer-specified moisture contents, or when not specified by the manufacturer, with the following moisture contents:
 1. Plaster and gypsum wallboard: 12 percent.
 2. Masonry, concrete, and concrete block: 12 percent.
 3. Interior located wood: 15 percent.
 4. Concrete floors: 7 percent.
- B. Do not apply coatings:
 1. Under dusty conditions or adverse environmental conditions, unless tenting, covers, or other such protection is provided for structures to be coated.
 2. When light on surfaces measures less than 15 foot-candles.
 3. When ambient or surface temperature is less than 55 degrees Fahrenheit unless manufacturer allows a lower temperature.
 4. When relative humidity is higher than 85 percent.
 5. When surface temperature is less than 5 degrees Fahrenheit above dew point.
 6. When surface temperature exceeds the manufacturer's recommendation.
 7. When ambient temperature exceeds 90 degrees Fahrenheit, unless manufacturer allows a higher temperature.
 8. Apply clear finishes at minimum 65 degrees Fahrenheit.
- C. Provide fans, heating devices, dehumidifiers, or other means recommended by coating manufacturer to prevent formation of condensate or dew on surface of substrate, coating between coats and within curing time following application of last coat.
- D. Provide adequate continuous ventilation and sufficient heating facilities to maintain minimum 55 degrees Fahrenheit for 24 hours before, during, and 48 hours after application of finishes.
- E. Dehumidification and heating for coating of digester interiors, wet wells, and high humidity enclosed spaces:
 1. Provide dehumidification and heating of digester interior spaces in which surface preparation, coating application, or curing is in progress according to the following schedule:
 - a. October 1 to April 30: Provide continuous dehumidification and heating as required to maintain the tanks within environmental ranges as specified in this Section and as recommended by the coating material

manufacturer. For the purposes of this Section, "continuous" is defined as 24 hours per day and 7 days per week.

- b. May 1 to September 30: Provide temporary dehumidification and heating as may be required to maintain the tanks within the specified environmental ranges in the event of adverse weather or other temporary condition. At Contractor's option and at his sole expense, Contractor may suspend work until such time as acceptable environmental conditions are restored, in lieu of temporary dehumidification and heating. Repair or replace any coating or surface preparation damaged by suspension of work, at Contractor's sole expense.
2. Equipment requirements:
 - a. Capacity: Provide dehumidification, heating, and air circulation equipment with minimum capacity to perform the following:
 - 1) Maintain the dew point of the air in the tanks at a temperature at least 5 degrees Fahrenheit less than the temperature of the coldest part of the structure where work is underway.
 - 2) Reduce dew point temperature of the air in the tanks by at least 10 degrees Fahrenheit in 20 minutes.
 - 3) Maintain air temperature in the tanks at 60 degrees Fahrenheit minimum.
 - b. Systems:
 - 1) Site electrical power: Not available for Contractor's use.
 - 2) Internal combustion engine generators: May be used; Contractor shall obtain all required permits and provide air pollution and noise control devices on equipment as required by permitting agencies.
 - 3) Dehumidification: Provide desiccant or refrigeration drying. Desiccant types shall have a rotary desiccant wheel capable of continuous operation. No liquid, granular, or loose lithium chloride drying systems will be allowed.
 - 4) Heating: Electric, indirect combustion, or steam coil methods may be used. Direct-fired combustion heaters will not be allowed during abrasive blasting, coating application, or coating cure time.
 3. Design and submittals:
 - a. Contractor shall prepare dehumidification and heating plan for this project, including all equipment and operating procedures.
 - b. Suppliers of services and equipment shall have not less than 3 years' experience in similar applications:
 - 1) Supplier: The following or equal:
 - a) Cargocaire Corporation (Munters) or equal.
 - c. Submit dehumidification and heating plan for Engineer's review.
 4. Monitoring and performance:
 - a. Measure and record relative humidity and temperature of air, and structure temperature twice daily (beginning and end of work shifts) to verify that proper humidity and temperature levels are achieved inside the work area after the dehumidification equipment is installed and

operational. Test results shall be made available to the Engineer upon request.

- b. Interior space of the working area and tank(s) shall be sealed, and a slight positive pressure maintained as recommended by the supplier of the dehumidification equipment.
- c. The filtration system used to remove dust from the air shall be designed so that it does not interfere with the dehumidification equipment's ability to control the dew point and relative humidity inside the reservoir:
 - 1) The air from the tank, working area, or dust filtration equipment shall not be recirculated through the dehumidifier during coating application or when solvent vapors are present.

1.09 MAINTENANCE

- A. Extra materials: Include minimum 1 gallon of each type and color of coating applied:
 - 1. When manufacturer packages material in gallon cans, deliver unopened labeled cans as comes from factory.
 - 2. When manufacturer does not package material in gallon cans, deliver material in new gallon containers, properly sealed and identified with typed labels indicating brand, type, and color.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Special coatings: One of the following or equal:
 - 1. Carboline: Carboline, St. Louis, MO.
 - 2. Ceilcote: International Protective Coatings, Berea, OH.
 - 3. Dampney: The Dampney Company, Everett, MA.
 - 4. Devoe: International Protective Coatings, Louisville, KY.
 - 5. Dudick: Dudick, Inc., Streetsboro, OH.
 - 6. GET: Global Eco Technologies, Pittsburg, CA.
 - 7. Henkel: Henkel North America, Madison Heights, MI.
 - 8. IET: Integrated Environmental Technologies, Santa Barbara, CA.
 - 9. PPC: Polymorphic Polymers Corp., North Miami, FL.
 - 10. PPG Amercoat: PPG Protective & Marine Coatings, Brea, CA.
 - 11. Rustoleum: Rustoleum Corp., Sommerset, NJ.
 - 12. Sanchem: Sanchem, Chicago, IL.
 - 13. Superior: Superior Environmental Products, Inc., Addison, TX.
 - 14. S-W: Sherwin-Williams Co., Cleveland, OH.
 - 15. Tnemec: Tnemec Co., Kansas City, MO.
 - 16. Wasser: Wasser High Tech Coatings, Kent, WA.
 - 17. ZRC: ZRC Worldwide Innovative Zinc Technologies, Marshfield, MA.

2.2 PREPARATION AND PRETREATMENT MATERIALS

- A. Metal pretreatment: As manufactured by one of the following or equal:
 - 1. Henkel: Galvaprep 5.
 - 2. International: AWLGrip Alumiprep 33.
- B. Surface cleaner and degreaser: As manufactured by one of the following or equal:

1. Carboline Surface Cleaner No. 3.
2. Devoe: Devprep 88.
3. S-W: Clean and Etch.

2.3 COATING MATERIALS

- A. Alkali-resistant bitumastic: As manufactured by one of the following or equal:
 1. As specified for Coal Tar Epoxy Substitute.
- B. Wax coating: As manufactured by one of the following or equal:
 1. Sanchem: No-Ox-Id A special.
- C. High solids epoxy (self-priming) not less than 72 percent solids by volume: As manufactured by one of the following or equal:
 1. Carboline: Carboguard 891.
 2. Devoe: Bar Rust 233H.
 3. PPG Amercoat: Amerlock 2.
 4. S-W: Macropoxy 646.
 5. Tnemec: HS Epoxy Series 104.
- D. 100-Percent solids epoxy: As manufactured by one of the following or equal:
 1. Carboline: Plasite 4500S.
 2. Tnemec: Series 435.
- E. Aliphatic or aliphatic-acrylic polyurethane: As manufactured by one of the following or equal:
 1. Carboline: Carbothane 134 VOC.
 2. Devoe: Devthane 379.
 3. PPG Amercoat: Amershield VOC.
 4. Non-submerged: S-W High Solids Polyurethane CA.
 5. Tnemec: Endura-Shield II Series 1075 U.
- F. Asphalt varnish: AWWA C 500.
- G. Coal tar: Where coal tar, coal-tar epoxy, or coal-tar mastic are specified or indicated on the Drawings, use coal-tar epoxy substitute in their place. Coal tar shall not be allowed.
- H. Coal-tar epoxy substitute: As manufactured by one of the following or equal:
 1. Devoe: Devtar 5A HS.
 2. S-W : Macropoxy 646 Black.
- I. Elastomeric polyurethane, 100-percent solids, ASTM D 16, Type V, (Urethane P): As manufactured by the following or equal:
 1. Primer: GET: Endura-Flex 12P
 2. Coating: GET: Endura-Flex EF-1988.
- J. Waterborne acrylic emulsion: As manufactured by one of the following or equal:
 1. S-W: DTM Acrylic B66W1.
 2. Tnemec: Tneme-Cryl Series 6.
 3. Caboline: Carbocrylic 3359

- K. Galvanizing zinc compound: As manufactured by one of the following or equal:
 - 1. ZRC: Cold Galvanizing Compound.
- L. 100-percent solids epoxy: As manufactured by the following or equal:
 - 1. S-W: Tank Clad HS
 - 2. Carboline: 891VOC

2.4 MIXES

- A. Mix in accordance with manufacturer's instructions.

2.5 EPOXY FILLER PATCHING MATERIAL

All bug holes and damaged areas in the areas of the surfaces to be painted, including both existing and new concrete, shall be repaired and surfaced with epoxy patching compound as specified hereinbelow in the locations identified by the Engineer.

The Contractor shall spray the ceiling and walls to a point four (4) feet below the ceiling with one (1) coat of Tnemec Series 66HS Epoxoline, or equal, for the purpose of highlighting the bug holes and defects in the concrete surface.

Epoxy filler patching material shall be Tnemec Series 215 concrete filler, Wil-Cor Armor Plate #990 trowellable epoxy putty, or equal, 100% solids epoxy patching material shall be trowelled into the bug holes and damaged area marked by the Engineer. The trowelled thickness shall be 1/32" to 1/16". The finished painting shall be compatible with the epoxy patching material.

Payment for epoxy filler material will be made on the basis of gallons of epoxy filler used as set forth in the bid item therefor.

PART 3 EXECUTION

3.1 GENERAL PROTECTION

- A. Protect adjacent surfaces from coatings and damage. Repair damage resulting from inadequate or unsuitable protection.
- B. Protect adjacent surfaces not to be coated from spatter and droppings with drop cloths and other coverings:
 - 1. Mask off surfaces of items not to be coated or remove items from area.
- C. Furnish sufficient drop cloths, shields, and protective equipment to prevent spray or droppings from fouling surfaces not being coated and, in particular, surfaces within storage and preparation areas.
- D. Place cotton waste, cloths, and material that may constitute a fire hazard in closed metal containers and remove daily from site.
- E. Remove electrical plates, surface hardware, fittings, and fastenings prior to application of coating operations. Carefully store, clean, and replace on completion

of coating in each area. Do not use solvent or degreasers to clean hardware that may remove permanent lacquer finish.

3.2 GENERAL PREPARATION

- A. Prepare surfaces in accordance with coating manufacturer's instructions, unless more stringent requirements are specified in this Section.
- B. Protect the following surfaces from abrasive blasting by masking or other means:
 - 1. Threaded portions of valve and gate stems, grease fittings, and identification plates.
 - 2. Machined surfaces for sliding contact.
 - 3. Surfaces to be assembled against gaskets.
 - 4. Surfaces of shafting on which sprockets are to fit.
 - 5. Surfaces of shafting on which bearings are to fit.
 - 6. Machined surfaces of bronze trim, including slide gates.
 - 7. Cadmium-plated items except cadmium-plated, zinc-plated, or sherardized fasteners used in assembly of equipment requiring abrasive blasting.
 - 8. Galvanized items, unless scheduled to be coated.
- C. Protect installed equipment, mechanical drives, and adjacent coated equipment from abrasive blasting to prevent damage caused by entering sand or dust.
- D. Concrete:
 - 1. Allow new concrete to cure for minimum of 28 days before coating.
 - 2. Clean concrete surfaces of dust, mortar, fins, loose concrete particles, form release materials, oil, and grease. Fill voids so that surface is smooth. Prepare concrete surface for coating in accordance with SSPC SP 13. Provide ICRI 310.2 CSP-3 surface profile, or as recommended by coating manufacturer. All concrete surfaces shall be vacuumed clean prior to coating application.
- E. Ferrous metal surfaces:
 - 1. Remove grease and oil in accordance with SSPC SP 1.
 - 2. Remove rust, scale, and welding slag and spatter, and prepare surfaces in accordance with appropriate SSPC standard as specified.
 - 3. Abrasive blast surfaces prior to coating:
 - a. When abrasive blasted surfaces rust or discolor before coating, abrasive blast surfaces again to remove rust and discoloration.
 - b. When metal surfaces are exposed because of coating damage, abrasive blast surfaces and feather in to a smooth transition before touching up.
 - c. Ferrous metal surfaces not to be submerged: Abrasive blast in accordance with SSPC SP 10, unless blasting may damage adjacent surfaces, prohibited, or specified otherwise. Where not possible to abrasive blast, power tool clean surfaces in accordance with SSPC SP 3.
 - d. Ferrous metal surfaces to be submerged: Unless specified otherwise, abrasive blast in accordance with SSPC SP 5 to clean and provide roughened surface profile of not less than 2 mils and not more than 4 mils in depth when measured with Elcometer 123, or as recommended by the coating manufacturer.
 - 4. All abrasive blast cleaned surfaces shall be blown down with clean dry air and/or vacuumed.

- F. Ductile iron pipe and fittings to be lined or coated: Abrasive blast clean in accordance with NAPF 500-03.
- G. Sherardized, aluminum, copper, and bronze surfaces: Prepare in accordance with coating manufacturer's instructions.
- H. Galvanized surface:
 - 1. Degrease or solvent clean (SSPC SP 1) to remove oily residue.
 - 2. Power tool or hand tool clean or whip abrasive blast.
 - 3. Test surface for contaminants using copper sulfate solution.
 - 4. Apply metal pretreatment within 24 hours before coating galvanized surfaces that cannot be thoroughly abraded physically, such as bolts, nuts, or preformed channels.
- I. Shop-primed metal:
 - 1. Certify that primers applied to metal surfaces in the shop are compatible with coatings to be applied over such primers in the field.
 - 2. Remove shop primer from metal to be submerged by abrasive blasting in accordance with SSPC SP 10, unless greater degree of surface preparation is required by coating manufacturer's representative.
 - 3. Correct abraded, scratched, or otherwise damaged areas of prime coat by sanding or abrasive blasting to bare metal in accordance with SSPC SP 2, SP 3, or SP 6, as directed by the Engineer. When entire shop priming fails or has weathered excessively (more than 25 percent of the item), or when recommended by coating manufacturer's representative, abrasive blast shop prime coat to remove entire coat and prepare surface in accordance with SSPC SP 10.
 - 4. When incorrect prime coat is applied, remove incorrect prime coat by abrasive blasting in accordance with SSPC SP 10.
 - 5. When prime coat not authorized by Engineer is applied, remove unauthorized prime coat by abrasive blasting in accordance with SSPC SP 10.
 - 6. Shop applied bituminous paint or asphalt varnish: Abrasive blast clean shop applied bituminous paint or asphalt varnish from surfaces scheduled to receive non-bituminous coatings.
- J. Cadmium-plated, zinc-plated, or sherardized fasteners:
 - 1. Abrasive blast in the same manner as unprotected metal when used in assembly of equipment designated for abrasive blasting.
- K. Abrasive blast components that are to be attached to surfaces that cannot be abrasive blasted before components are attached.
- L. Grind sharp edges to approximately 1/16-inch radius before abrasive blast cleaning.
- M. Remove and grind smooth all excessive weld material and weld spatter before blast cleaning in accordance with NACE SP0178.
- N. Poly vinyl chloride (PVC) and FRP surfaces:

1. Prepare surfaces to be coated by light sanding (de-gloss) and wipe-down with clean cloths, or by solvent cleaning in strict accordance with coating manufacturer's instructions.
- O. Cleaning of previously coated surfaces:
1. Utilize cleaning agent to remove soluble salts such as chlorides and sulfates from concrete and metal surfaces:
 - a. Cleaning agent: Biodegradable non-flammable and containing no VOC.
 - b. Manufacturer: The following or equal:
 - 1) CHLOR*RID International, Inc.
 2. Steam clean and degrease surfaces to be coated to remove oils and grease.
 3. Cleaning of surfaces utilizing the decontamination cleaning agent may be accomplished in conjunction with abrasive blast cleaning, steam cleaning, high-pressure washing, or hand washing as approved by the coating manufacturer's representative and the Engineer.
 4. Test cleaned surfaces in accordance with the cleaning agent manufacturer's instructions to ensure all soluble salts have been removed. Additional cleaning shall be carried out as necessary.
 5. Final surface preparation prior to application of new coating system shall be made in strict accordance with coating manufacturer's printed instructions.

3.3 MECHANICAL AND ELECTRICAL EQUIPMENT PREPARATION

- A. Identify equipment, ducting, piping, and conduit to be coated.
- B. Remove grilles, covers, and access panels for mechanical and electrical system from location and coat separately.
- C. Prepare and finish coat primed equipment with color selected by the Engineer.
- D. Prepare and prime and coat insulated and bare pipes, conduits, boxes, insulated and bare ducts, hangers, brackets, collars, and supports, except where items are covered with prefinished coating.
- E. Replace identification markings on mechanical or electrical equipment when coated over or spattered.
- F. Prepare and coat interior surfaces of air ducts, and convactor and baseboard heating cabinets that are visible through grilles and louvers with 1 coat of flat black paint, to limit of sight line.
- G. Prepare and coat dampers exposed immediately behind louvers, grilles, and convactor and baseboard heating cabinets to match face panels.
- H. Prepare and coat exposed conduit and electrical equipment occurring in finished areas with color and texture to match adjacent surfaces.
- I. Prepare and coat both sides and edges of plywood backboards for electrical equipment before installing backboards and mounting equipment on them.

- J. Color code equipment, piping, conduit, and exposed ductwork and apply color banding and identification, such as flow arrows, naming, and numbering, in accordance with the Contract Documents.

3.4 GENERAL APPLICATION REQUIREMENTS

- A. Apply coatings in accordance with manufacturer's instructions.
- B. Coat metal unless specified otherwise:
 - 1. Aboveground piping to be coated shall be empty of contents during application of coatings.
- C. Verify metal surface preparation immediately before applying coating in accordance with SSPC SP COM.
- D. Allow surfaces to dry, except where coating manufacturer requires surface wetting before coating.
- E. Wash coat and prime sherardized, aluminum, copper, and bronze surfaces, or prime with manufacturer's recommended special primer.
- F. Prime shop-primed metal surfaces. Spot prime exposed metal of shop-primed surfaces before applying primer over entire surface.
- G. Multiple coats:
 - 1. Apply minimum number of specified coats.
 - 2. Apply additional coats when necessary to achieve specified thicknesses.
 - 3. Apply coats to thicknesses specified, especially at edges and corners.
 - 4. When multiple coats of same material are specified, tint prime coat and intermediate coats with suitable pigment to distinguish each coat.
 - 5. Lightly sand and dust surfaces to receive high-gloss finishes, unless instructed otherwise by coating manufacturer.
 - 6. Dust coatings between coats.
- H. Coat surfaces without drops, overspray, dry spray, runs, ridges, waves, holidays, laps, or brush marks.
- I. Remove spatter and droppings after completion of coating.
- J. Apply coating by brush, roller, trowel, or spray, unless particular method of application is required by coating manufacturer's instructions or these Specifications.
- K. Plural component application: Drums shall be premixed each day. All gauges shall be in working order prior to the start of application. Ratio checks shall be completed prior to each application. A spray sample shall be sprayed on plastic sheeting to ensure set time is complete prior to each application. Hardness testing shall be performed after each application.
- L. Spray application:

1. Stripe coat edges, welds, nuts, bolts, and difficult-to-reach areas by brush before beginning spray application, as necessary, to ensure specified coating thickness along edges.
 2. When using spray application, apply coating to thickness not greater than that recommended in coating manufacturer's instructions for spray application.
 3. Use airless spray method, unless air spray method is required by coating manufacturer's instruction or these Specifications.
 4. Conduct spray coating under controlled conditions. Protect adjacent construction and property from coating mist, fumes, or overspray.
- M. Drying and recoating:
1. Provide fans, heating devices, or other means recommended by coating manufacturer to prevent formation of condensate or dew on surface of substrate, coating between coats and within curing time following application of last coat.
 2. For submerged service, the Contractor shall provide a letter to the Engineer that the lining system is fully cured and ready to be placed into service.
 3. Limit drying time to that required by these Specifications or coating manufacturer's instructions.
 4. Do not allow excessive drying time or exposure, which may impair bond between coats.
 5. Recoat epoxies within time limits recommended by coating manufacturer.
 6. When time limits are exceeded, abrasive blast clean and de-gloss clean prior to applying another coat.
 7. When limitation on time between abrasive blasting and coating cannot be met before attachment of components to surfaces that cannot be abrasive blasted, coat components before attachment.
 8. Ensure primer and intermediate coats of coating are unscarred and completely integral at time of application of each succeeding coat.
 9. Touch-up suction spots between coats and apply additional coats where required to produce finished surface of solid, even color, free of defects.
 10. Leave no holidays.
 11. Sand and feather in to a smooth transition and recoat scratched, contaminated, or otherwise damaged coating surfaces so damages are invisible to the naked eye.
- N. Concrete:
1. Apply first coat (primer) only when surface temperature of concrete is decreasing in order to eliminate effects of off-gassing on coating.

3.5 ALKALI-RESISTANT BITUMASTIC (Coating System C-1)

- A. Preparation:
1. Prepare surfaces in accordance with general preparation requirements.
- B. Application:
1. Apply in accordance with general application requirements and as follows:
 - a. Apply at least 2 coats, 8 to 14 mils DFT each.

3.6 WAX COATING (Coating System C-2)

- A. Preparation:
 - 1. Prepare surfaces in accordance with general preparation requirements.
- B. Application:
 - 1. Apply in accordance with general application requirements and as follows:
 - a. Apply at least 1/32-inch thick coat with 2-inch or shorter bristle brush.
 - b. Thoroughly rub coating into metal surface with canvas covered wood block or canvas glove.

3.7 HIGH SOLIDS EPOXY SYSTEM (**Coating System C-3**)

- A. Preparation:
 - 1. Prepare surfaces in accordance with general preparation requirements and as follows:
 - a. Abrasive blast ferrous metal surfaces to be submerged at jobsite in accordance with SSPC SP 5 prior to coating. When cleaned surfaces rust or discolor, abrasive blast surfaces in accordance with SSPC SP 10.
 - b. Abrasive blast non-submerged ferrous metal surfaces at jobsite in accordance with SSPC SP 10, prior to coating. When cleaned surfaces rust or discolor, abrasive blast surfaces in accordance with SSPC SP 6.
 - c. Abrasive blast clean ductile iron surfaces at jobsite in accordance with SSPC SP 7.
- B. Application:
 - 1. Apply coatings in accordance with general application requirements and as follows:
 - a. Apply minimum 2-coat system with minimum total DFT of 12 mils.
 - b. Recoat or apply succeeding epoxy coats within time limits recommended by manufacturer. Prepare surfaces for recoating in accordance with manufacturer's instructions.
 - c. Coat metal to be submerged before installation when necessary, to obtain acceptable finish, and to prevent damage to other surfaces.
 - d. Coat entire surface of support brackets, stem guides, pipe clips, fasteners, and other metal devices bolted to concrete.
 - e. Coat surface of items to be exposed and adjacent 1 inch to be concealed when embedded in concrete or masonry.

3.8 HIGH SOLIDS EPOXY AND POLYURETHANE COATING SYSTEM (**Coating System C-4**)

- A. Preparation:
 - 1. Prepare surfaces in accordance with general preparation requirements and as follows:
 - a. Prepare concrete surfaces in accordance with general preparation requirements.
 - b. Touch up shop-primed steel and miscellaneous iron.
 - c. Abrasive blast ferrous metal surfaces at jobsite prior to coating. Abrasive blast clean rust and discoloration from surfaces.
 - d. Degrease or solvent clean, whip abrasive blast, power tool, or hand tool clean galvanized metal surfaces.

- e. Lightly sand (de-gloss) fiberglass and PVC pipe to be coated and wipe clean with dry cloths, or solvent clean in accordance with coating manufacturer's instructions.
- f. Abrasive blast clean ductile iron surfaces.

B. Application:

- 1. Apply coatings in accordance with general application requirements and as follows:
 - a. Apply a 3-coat system consisting of:
 - 1) Primer: 4 to 5 mils DFT high solids epoxy.
 - 2) Intermediate coat: 4 to 5 mils DFT high solids epoxy.
 - 3) Topcoat: 2.5 to 3.5 mils DFT aliphatic or aliphatic-acrylic polyurethane topcoat.
- 2. Recoat or apply succeeding epoxy coats within 30 days or within time limits recommended by manufacturer, whichever is shorter. Prepare surfaces for recoating in accordance with manufacturer's instructions.

3.9 100-PERCENT SOLIDS EPOXY SYSTEM (Coating System C-5)

A. Preparation:

- 1. Prepare surfaces in accordance with general preparation requirements and as follows:
 - a. Bare ferrous metal surfaces shall be prepared in accordance with SSPC SP-5 to achieve a minimum uniform surface profile of 3.0 mils.

B. Application:

- 1. Apply coatings in accordance with general application requirements and as follows:
 - a. Apply minimum 1-coat system with minimum total dry film thickness (DFT) of 40-60 mils.
 - b. Recoat within time limits recommended by manufacturer. Prepare surfaces for recoating in accordance with manufacturer's instructions.
 - c. Holiday detection shall be performed in accordance with ASTM D5162 over 100% of the coated surface area to identify any holidays or pinholes that must be repaired. Pinholes and holidays identified by Holiday Detection shall be repaired as follows:
 - 1) Using a pencil grinder, remove a ½-inch diameter area of the coating system material back to the ferrous metal substrate. The metal must be shiny.
 - 2) Aggressively sand or abrade the intact coating system surface 2 inches around the complete periphery of the ½-inch diameter removal area to produce a uniform 6 to 8 mils profile.
 - 3) Vacuum clean the prepared area to remove all dust and dirt to achieve a clean, sound surface.
 - 4) Tape the peripheral area to prevent coating application onto unprepared surfaces.
 - 5) Brush apply one coat of the finish coating material. Following proper recoat cure time, apply additional coats of the finish coating system to achieve 60 mils DFT at the coating removal area and feather the coating onto the roughened coated surfaces to form a neat repair outline.

3.10 ASPHALT VARNISH (**Coating System C-6**)

- A. Preparation:
 - 1. Prepare surfaces in accordance with general preparation requirements.
- B. Application:
 - 1. Apply coatings in accordance with general application requirements and as follows:
 - a. Apply minimum 2 coats.

3.11 ELASTOMERIC POLYURETHANE (100 PERCENT SOLIDS) (**Coating System C-7**)

- A. Preparation:
 - 1. Prepare surfaces in strict accordance with coating manufacturer's instructions and as directed and approved by coating manufacturer's representative.
- B. Application:
 - 1. Apply epoxy primer at DFT of 1 to 2 mils, in strict accordance with manufacturer's instructions.
 - 2. Apply polyurethane coating at minimum total DFT as follows:
 - a. Steel: 60 mils DFT.
 - b. Ductile iron and ductile iron pipe coating and lining: 30 mils DFT.
 - c. Concrete: Apply total dry film thickness (DFT) of 250 mils, or as required to be pin-hole free, consisting of a minimum 200 mils of expanded Endura-Flex EF 1988 with minimum 50 mils topcoat of solid Endura-Flex 1988.
 - d. Or as recommended by the coating manufacturer and accepted by the Engineer.
 - 3. For concrete application, provide saw cutting for coating terminations in strict accordance with manufacturer's instructions.
 - 4. Perform high voltage holiday detection test in accordance with NACE SP0188, over 100 percent of coated surface areas to ensure pinhole free finished coating system.

3.12 WATERBORNE ACRYLIC EMULSION (**Coating C-8**)

- A. Preparation:
 - 1. Remove all oil, grease, dirt, and other foreign material by solvent cleaning in accordance with SSPC SP 1.
 - 2. Lightly sand all surfaces and wipe thoroughly with clean cotton cloths before applying coating.
- B. Application:
 - 1. Apply 2 or more coats to obtain a minimum DFT of 5.0 mils.

3.13 FIELD QUALITY CONTROL

- A. Each coat will be inspected. Strip and remove defective coats, prepare surfaces, and recoat. When approved, apply next coat.

- B. Control and check DFT and integrity of coatings.
- C. Measure DFT with calibrated thickness gauge.
- D. DFT on ferrous-based substrates may be checked with Elcometer Type 1 Magnetic Pull-Off Gauge or PosiTector® 6000.
- E. Verify coat integrity with low-voltage sponge or high-voltage spark holiday detector, in accordance with NACE SP0188. Allow Engineer to use detector for additional checking.
- F. Check wet film thickness before coal-tar epoxy coating cures on concrete or non ferrous metal substrates.
- G. Arrange for services of coating manufacturer's field representative to provide periodic field consultation and inspection services to ensure proper surface preparation of facilities and items to be coated, and to ensure proper application and curing:
 - 1. Notify Engineer 24 hours in advance of each visit by coating manufacturer's representative.
 - 2. Provide Engineer with a written report by coating manufacturer's representative within 48 hours following each visit.

3.14 SCHEDULE OF ITEMS NOT REQUIRING COATING

- A. General: Unless specified otherwise, the following items do not require coating:
 - 1. Items that have received final coat at factory and are not listed to receive coating in field.
 - 2. Aluminum, brass, bronze, copper, plastic (except PVC pipe), rubber, stainless steel, chrome, Everdur, or lead.
 - 3. Buried or encased piping or conduit.
 - 4. Exterior concrete.
 - 5. Galvanized steel wall framing, galvanized electrical conduits, galvanized pipe trays, galvanized cable trays, and other galvanized items:
 - a. Areas on galvanized items or parts where galvanizing has been damaged during handling or construction shall be repaired as follows:
 - 1) Clean damaged areas by SSPC SP 1, SP 2, SP 3, or SP 7 as required.
 - 2) Apply 2 coats of a galvanizing zinc compound in strict accordance with manufacturer's instructions.
 - 6. Grease fittings.
 - 7. Fiberglass ducting or tanks in concealed locations.
 - 8. Steel to be encased in concrete or masonry.

3.15 SCHEDULE OF SURFACES TO BE COATED IN THE FIELD

- A. In general, apply coatings to steel, iron, galvanized surfaces, and wood surfaces unless specified or otherwise indicated on the Drawings. Coat concrete surfaces and anodized aluminum only when specified or indicated on the Drawings. Color coat all piping as specified in this section.

B. The following schedule is incomplete. Coat unlisted surfaces with same coating system as similar listed surfaces. Verify questionable surfaces.

C. Coating Schedule

LOCATION	COATING SYSTEM NUMBER				
	CONCRETE & MASONRY (INCLUDING DRY WALL)			METALWORK (INCLUDING PLASTIC PIPE)	
	EXTERIOR		INTERIOR	SUBMERGED	EXPOSED
	BELOW GRADE	ABOVE GRADE			
PAYRAN SEWER LIFT STATION					
PUMP PIT/WET WELL					
All Piping, Metalwork	--	--	--	C-7	C-7
Pumps	--	--	--	C-3	--
VALVE PIT					
Concrete (except floor)	--	--	C-3	--	--
All Piping, Metalwork	--	--	--	--	C-4
BUILDING					
Wall/Ceiling		C-8	C-8		C-8
Electrical					C-8

END OF SECTION

SECTION 11310
PUMPING UNITS

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE OF WORK

The Contractor shall furnish and install complete, tested and operating, the equipment shown on the Drawings and specified herein.

B. WORK INCLUDED IN THIS SECTION

The Contractor shall furnish and install the following equipment for the Payran Lift Station Rehabilitation Project as more particularly specified hereinbelow.

<u>Section</u>	<u>Type of Pump</u>
2.01	Non-Clog Submersible Sewage Pumps

C. RELATED WORK SPECIFIED IN OTHER TECHNICAL SECTIONS

1. Cast-in-Place Concrete: Section 03310
2. Pipework: Section 15050
3. Electrical Work General: Section 16050

1.02 QUALITY ASSURANCE

A. MATERIALS

All materials, equipment and parts furnished under this section shall be new and unused and shall:

1. Be a product of a manufacturer who has been regularly engaged in the design and manufacture of the equipment.
2. Be demonstrated to satisfaction of the Engineer that the quality is equal to equipment made by those manufacturers specifically named herein.

B. STANDARDS

The test code of the American Hydraulic Institute for testing pumps and good engineering practice shall be used. All criteria shall be supplied at HI Level grade A.

C. SERVICE CONDITIONS

1. Each pumping unit shall be designed to operate at a speed not greater than that specified herein, and to be driven by a motor not greater than the stipulated horsepower.
2. The pumping heads specified herein represent the total dynamic head in feet of water against which the pumps, individually or in parallel, shall operate, corresponding to the discharge quantities specified. The shutoff head for each pump shall be as high as practicable to insure satisfactory flushing action to keep the pump impeller and discharge pipework end clear.
3. A tolerance of plus or minus 10% will be permitted in the discharge capacity set forth in the specified conditions of operation for the pumping units, operating in parallel in order to come within the range of the standard design characteristics of pump impellers furnished by the manufacturers of this equipment.
4. The pumping units shall have hydraulic characteristics throughout such as to preclude the overloading of their respective drive motors for the entire operating range of each individual pump or combination of pumps.

D. SHOP PAINTING

The pumps and appurtenances shall receive one (1) shop coat of the manufacturer's standard rust-inhibiting primer followed by one (1) coat of machinery enamel and shall be field coated as specified herein.

1.03 SUBMITTALS

A. SHOP DRAWINGS

The Contractor shall submit shop drawings for favorable review by the Engineer in accordance with these specifications. Sufficient data shall be included to show that equipment conforms to specification requirements to the satisfaction of the Engineer.

B. MANUALS

The Contractor shall furnish manufacturer's detailed operating and maintenance data, including installation, lubrication and maintenance manuals, bulletins and spare parts lists in accordance with these specifications.

C. AFFIDAVITS

The Contractor shall furnish affidavits from the manufacturer stating that the sewage pumps and appurtenances have been properly installed and tested and each is ready for operation.

D. SERVICE

The manufacturer shall certify that he/she has an authorized dealer housing spare parts and a service facility in the area.

1.04 PAYMENT

- A. The cost of all pumping units and appurtenances shall be included in the bid prices for the construction work and no additional compensation will be allowed.

PART 2 - PRODUCTS

2.01 NON-CLOG SUBMERSIBLE SEWAGE PUMPS

A. GENERAL

Under this item, the Contractor shall furnish and install two (2) non-clog submersible pumps, as shown on the plans and as hereinafter specified, together with quick lift assemblies, interconnecting pipework, motors, electrical controls and appurtenances, complete, and in satisfactory operating condition. The pumping units shall be explosion proof.

B. TYPE AND MANUFACTURE

The pumping units shall be suitable for pumping raw sewage and shall be designed and fully guaranteed for this use. The fluid temperature range shall be from 40 degrees to 115 degrees F.

Each pump and motor supplied under this specification shall be suitable for continuous operation; under submerged, partially submerged or dry conditions. Without derating the motor, the pump shall be able to pump continuously with the motor exposed and the water level at the top of the volute under full load, without the need of spray systems, secondary pumps, or air moving equipment.

Pumping units (liquid end and motors) provided under this section shall be Flygt in order to achieve standardization within the Agency. No other manufacturer is acceptable.

C. OPERATING REQUIREMENTS

	<u>Payran Sewer Lift Station</u>
Number of Pumps	2
Capacity at Total Head 1, gpm/ft	500/47
Capacity at Total Head 2, gpm/ft*	800/29
Minimum Hydraulic (overall) Efficiency, %	
Capacity 1	59.7%
Capacity 2	51%
Maximum KW Draw at Capacity	6.1
Minimum Shutoff Head, ft	83
Pump Speed, rpm	1720
Minimum Motor HP	10
Voltage/Cycle/Phase	230/60/3
Service Factor	1.15 combined
Motor Power Factor	0.88
Insulation Rating	H
Ambient Temperature, °C	40
Enclosure	Submersible
Discharge, inches	4"

Maximum Locked Rotor Current, amps	134
FLA, amps	50
Motor Efficiency	84%
Vanes	2
NEC Code Letter	G
Identification No. of temperature device	T4
Motor minimum cable length, ft	50
Model Number	Flygt NP3127 HT 3 Impeller 488

*To be guaranteed by Hydraulic Institute, HI Level 1B eff

D. PUMP DESIGN

The pumps shall be capable of handling raw, unscreened sewage. The discharge elbow shall be permanently installed in the wet well along with the discharge piping. The pumps shall be automatically connected to the discharge connection elbow when lowered into place. Pumps shall be easily removable for inspection or service, requiring no bolts, nuts or other fastenings to be removed for the purpose and no need for personnel to enter the pump well. Sealing of the pumping unit to the discharge elbow shall be accomplished by a simple linear downward motion of the pumps with the entire weight of the pumping units guided to and pressed tightly against the discharge elbow with a metal-to-metal watertight contact. Sealing of the discharge interface by means of a diaphragm, O-ring or other device will not be acceptable. No portion of the pump shall bear directly on the floor of the sump, and there shall be no more than one 90 degree bend allowed between the volute discharge flange and sump piping. The two guide bars, which shall guide the pump into proper contact with the discharge elbow, shall be non-adjustable and shall not bear the weight of the pump. Systems using one guide bar or cable to guide the pump are not acceptable.

E. PUMP CONSTRUCTION

Major pump components shall be of gray cast iron, ASTM A-48, Class 30, with smooth surfaces void of blow holes and other irregularities. Where watertight sealing is required, O-rings made of nitrile rubber shall be used. All exposed nuts and bolts shall be made of 304 stainless steel. The interior shall be sprayed with a PVC epoxy primer and the exterior sprayed with an epoxy primer and chloric rubber paint finish.

All mating surfaces where watertight sealing is required shall be machined and fitted with nitrile rubber 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 nitrile rubber O-rings without the requirement of a specific torque limit. No secondary sealing compounds, gaskets, elliptical O-rings, grease or other devices shall be used. The lifting bale shall be Type 316 Stainless steel.

F. CABLE SEAL

The cable entry water seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall be comprised of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the entry body

containing a strain relief function, separate from the function of sealing the cable. The assembly shall bear against a shoulder. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the motor interior from foreign material gaining access through the pump top. Epoxies, silicones or other secondary sealing systems shall not be considered acceptable.

G. COOLING SYSTEM

Each unit shall be provided with an integral motor cooling system. A stainless steel motor cooling jacket shall encircle the stator housing, providing for dissipation of motor heat regardless of the type of pump installation. An impeller, integral to the closed loop cooling system and driven by the pump shaft, shall provide the necessary circulation of the cooling liquid through the jacket. The cooling liquid shall pass about the stator housing in the closed loop system in turbulent flow providing for superior heat transfer. The cooling system shall have one fill port and one drain port integral to the cooling jacket. The cooling system shall provide for continuous pump operation in liquid or ambient temperatures of up to 104°F (40°C). Operational restrictions at temperatures below 104°F are not acceptable. Fans, blowers or auxiliary cooling systems that are mounted external to the pump motor are not acceptable.

H. MECHANICAL SEAL

Each pump shall be provided with a positively driven dual, tandem mechanical shaft seal system consisting of two seal sets, each having an independent spring. The lower primary seal, located between the pump and seal chamber, shall contain one stationary and one positively driven rotating corrosion and abrasion resistant tungsten-carbide ring. The upper secondary seal, located between the seal chamber and the seal inspection chamber shall be a leakage-free seal. The upper seal shall contain one stationary and one positively driven rotating corrosion and abrasion resistant tungsten-carbide seal ring. Silicon carbide, carbon or other materials for the seal faces shall not be accepted. The rotating seal ring shall have small back-swept grooves laser inscribed upon its face to act as a pump as it rotates, returning any fluid that should enter the dry motor chamber back into the lubricant chamber. All seal rings shall be individual solid sintered rings. Each seal interface shall be held in place by its own spring system. The seals shall not depend upon direction of rotation for sealing. Mounting of the lower seal on the impeller hub is not acceptable. Shaft seals without positively driven rotating members or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces are not acceptable. The seal springs shall be isolated from the pumped media to prevent materials from packing around them, limiting their performance.

Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and shall provide capacity for lubricant expansion. The seal lubricant chamber shall have one drain and one inspection plug that are accessible from the exterior of the motor unit. The seal system shall not rely upon the pumped media for lubrication.

The area about the exterior of the lower mechanical seal in the cast iron housing shall have cast in an integral concentric spiral groove. This groove shall protect the seals by causing abrasive particulate entering the seal cavity to be forced out away from the seal due to centrifugal action.

A separate seal leakage chamber shall be provided so that any leakage that may occur past the upper, secondary mechanical seal will be captured prior to entry into the motor stator housing. Such seal leakage shall not contaminate the motor lower bearing. The leakage chamber shall be equipped with a float type switch that will signal if the chamber should reach 50% capacity.

I. IMPELLER

The impeller shall be of Hard-Iron™ (ASTM A-532 (Alloy III A) 25% chrome cast iron), dynamically balanced, semi-open, multi-vane, back swept, screw-shaped, non-clog design. The impeller leading edges shall be mechanically self-cleaned automatically upon each rotation as they pass across a spiral groove located on the volute suction. The leading edge shall not be vertical or perpendicular the insert ring or parallel to the shaft. The leading edges of the impeller shall be hardened to Rc 60 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater. The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 5% sludge and rag-laden wastewater. The impeller shall be capable of momentarily moving axially upwards a distance of 15mm/0.6-in. to allow larger debris to pass through and immediately return to normal operating position. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw. The impeller shall be locked to the shaft, held by an impeller bolt and shall be coated with alkyd resin primer. Impellers that have surface hardening will not be allowed. Brush/spray-on coating such as Belzona 'Metal-glide' or flame spray coating by means of HVOF are not acceptable.

J. VOLUTE / SUCTION COVER

The pump volute shall be a single piece grey cast iron, ASTM A-48, Class 35B, non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. The volute shall have a replaceable suction cover insert ring in which are cast spiral-shaped, sharp-edged groove(s). The spiral groove(s) shall provide trash release pathways and sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. Grooves shall not be circular. The insert ring shall be cast of Hard-Iron™ (ASTM A-532 (Alloy III A) 25% chrome cast iron) and provide effective sealing between the multi-vane semi-open impeller and the volute housing. Brush/spray-on coating such as Belzona 'Metal-glide' or flame spray coating by means of HVOF are not acceptable.

K. BEARINGS

Motor bearings shall be designed such that the computed AFBMA B-10 life rating is not less than 18,000 hours. Bearings shall be permanently grease lubricated. The pump shaft shall rotate on two (2) permanently lubricated bearings. The upper bearing shall be a single row deep groove bearing, and the lower bearing shall be a two row angular contact ball bearing.

L. MOTOR

The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, 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 stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be specifically designed for submersible pump usage and designed for continuous duty pumping media of up to 40°C (104°F) with an 80°C temperature rise and capable of at least 15 evenly spaced starts per hour. The motor shall not have temperatures under normal operation of greater than 135 degrees C. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches (rated at 135 degrees C) shall be embedded in the stator end coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The junction chamber shall be sealed off from the stator housing and shall contain a terminal board for connection of power and pilot sensor cables using threaded compression type terminals. The use of wire nuts or crimp-type connectors is not acceptable. The motor shall be NEMA MG-1 rated for inverter duty. The same manufacturer shall produce the motor and the pump.

The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C. A performance chart shall be provided upon request showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics.

The power cable shall be designed specifically for use with submersible pumps and shall be type SUBCAB (SUBmersible CABLE). The cable shall be rated and applied in accordance with the National Electrical Code (NEC). The outer jacket shall be oil resistant chlorinated polyethylene rubber, and the copper conductors shall be insulated with high density ethylene-propylene rubber (HEPR). Each current carrying conductor shall be fitted with a concentric braided type shield. The filler and conductor separator materials shall be of non-wicking vulcanized rubber. All jacket and insulation materials shall be lead free. The cable outer jacket shall be marked "Water Resistant". The cable shall be rated for 750 volts and 90° C with a 40° C ambient temperature and shall be approved by Factory Mutual (FM). The cable length shall be adequate to reach the junction box without the need for splices. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of at least 65 feet.

The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

M. PROTECTION

All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. At 125°C (260°F) the thermal switches shall open, stop the motor and activate an alarm.

A leakage sensor shall be available as an option to detect water in the stator chamber. The Float Leakage Sensor (FLS) is a small float switch used to detect the presence of water in the stator chamber. When activated, the FLS will stop the motor and send an alarm both local and/or remote. **USE OF VOLTAGE SENSITIVE SOLID STATE SENSORS AND TRIP TEMPERATURE ABOVE 125°C (260°F) SHALL NOT BE ALLOWED.**

The thermal switches, and FLS shall be connected to a Mini CAS (Control and Status) monitoring unit. The Mini CAS shall be designed to be mounted in any control panel.

Q. EXPLOSION-PROOF SERVICE

The pump system and appurtenances, including the pump, motor and wiring, shall be approved by a nationally approved testing agency for installation in the State of California for explosion-proof service. The system shall be rated for Class 1, Division 1, Group C and D service as determined by the National Electric code and approved by a nationally recognized testing agency (U.L. or F.M.) at the time of bidding of this project.

R. GUIDE BARS AND BRACKETS

Two (2) type 316 stainless steel guide bars, size 3 inch, shall be provided for guiding each of the pumping units in raising and lowering. The guide bars shall not support any portion of the weight of the pump. The lower guide bar holders shall be integral with the discharge elbow. Guide rope or single bars are not acceptable.

Each pumping unit shall be guided on the bars by a guide bracket which shall be an integral part of the pump. The use of one guide, guide ropes or the requirement of personnel in the wet well when connecting the pump is unacceptable.

Provide intermediate stainless steel guide bar brackets as necessary for stability of the guide bars.

S. LIFTING CABLE AND FITTINGS

Each pump shall be fitted with 35 feet of Type 316 stainless steel chain capable of lifting the pump and motor. A grip eye lifting system and all other necessary fittings shall be provided, including an eyebolt installed as shown on the plans.

T. PAINTING

The equipment specified in this section shall be factory coated with an epoxy primer. An epoxy finish shall be field applied per Specifications Section 09900.

U. SPARE PARTS

In addition to the spare pump specified above, the Contractor shall supply one (1) mechanical seal set, O-ring set , bearing set and wear ring set (if required) for the model of submersible sewage pump furnished.

V. WARRANTY

The pump and motor manufacturer shall warranty the units against defects in installation and materials for a period of five (5) years or 10,000 hours for both parts and labor at a prorated basis.

PART 3 – EXECUTION

3.01 INSTALLATION

A. GENERAL

All pumping equipment shall be installed in strict conformance with the manufacturer's installation drawings and instructions.

B. ANCHOR BOLTS

All anchor bolts within the wet well shall be Type 316 stainless steel. Pumps may be secured with Type 316 stainless steel epoxy-capsule type anchor bolts, Molly Para bond, or equal.

C. PIPEWORK

1. GENERAL. The Contractor shall furnish and install all discharge pipework, complete with valves, fittings, specials and flexible couplings and appurtenances, together with discharge manifold.
2. PIPEWORK. All pipework specified herein and shown on the plans shall be installed in a workmanlike manner with all pipe runs truly parallel with vertical and horizontal axes. All sections of pipework shall be rigidly bolted or welded together after being cut accurately to length in such a manner as to relieve any and all parts of undue strain from closure or flanged on other joints. All pipework shall be furnished and installed in accordance with Section 15050 - Pipework.
3. APPURTENANCES. Included under this item are the appurtenances for the complete pumping unit as detailed on the plans.

3.02 FIELD SERVICE AND CLASS

The manufacturer of the machines shall supply a competent field service engineer for one-half (½) day per pump to thoroughly check and inspect the machines after installation, place the machines in operation and make necessary adjustments, and instruct plant personnel in proper operating and maintenance procedures.

The manufacturer shall also provide for attendance for two (2) Agency employees at the local factory school on repair of Flygt pumps.

3.03 TESTS

A. FACTORY TESTS

The pump manufacturer shall perform the factory inspections and tests on each pump before shipment from factory. The manufacturer shall furnish with each pump at the time of shipment a written report stating that the inspections and tests have been done. Each

pump shall be tested at the factory under Hydraulic Institute Level A standards for the following for 60 hertz, 50 hertz and 40 hertz.

- a. Seven points to establish a pump curve
- b. Flow, head, power in KW, overall efficiency , amps and volts

B. ACCEPTANCE TESTS

After installation, each pumping unit shall be given a running test, during which it shall demonstrate its ability to operate without vibration, overheating or excessive current draw, and to pump the capacity and head specified. These tests are to be conducted by the Contractor in the presence of the Engineer. The Engineer shall be given at least 24 hours' notice in advance of each test.

During the tests, observations shall be made of head, capacity, motor input, vibration, noise and overheating to detect any defects in the equipment. In addition, pumping capacity measurements shall be taken in the presence of the Engineer by pumping down the wet well and measuring the time it takes water to drop a given depth. This procedure shall be repeated at least three (3) times for each pump or as necessary to obtain an installed capacity. Written results of each test shall be submitted by the Contractor to the Engineer prior to approval of the tested pumps.

The Contractor shall provide, at his/her expense, the necessary water, gauges, meters, piping and labor necessary for conducting the tests. All adjustments needed to place the equipment in satisfactory working order shall be made at the time of the tests. All defects or defective equipment revealed by or noted during a test shall be corrected or replaced promptly at the expense of the Contractor and, if necessary, tests shall be repeated until satisfactory results are obtained.

In case the Contractor is unable to demonstrate to the satisfaction of the Engineer that the units will satisfactorily perform the service required and that they will operate free from vibration and heating, the units may be rejected. The Contractor shall then remove and replace the equipment at his/her own expense.

END OF SECTION

SECTION 15050

PIPEWORK

PART 1 - GENERAL

1.01 DESCRIPTION

A. WORK INCLUDED IN THIS SECTION

The Contractor shall furnish, install and test all pipework, including fittings, valves and appurtenances as shown on the drawings and described in these specifications as required to completely interconnect all equipment with piping for complete and operable systems.

B. RELATED WORK SPECIFIED IN OTHER TECHNICAL SECTIONS

1. Excavation and Backfill: Section 02200
2. High Performance Coatings: Section 09960
3. Pumping Units: Section 11310
4. Electrical Requirements: Section 16100

1.02 QUALITY ASSURANCE

A. MANUFACTURE

All materials and equipment furnished under this section shall: (1) be of a manufacturer who has been regularly engaged in the design and manufacture of the materials and equipment; and (2) be demonstrated to the satisfaction of the Engineer that the quality is equal to the materials and equipment made by those manufacturers specifically named herein, if an alternate product manufacturer is proposed.

B. CODES

Pipe materials and fittings shall meet specific ASTM, ASA, AWWA, commercial or Federal Specification Standards, as designated herein.

C. INSPECTION

All piping materials delivered to the job site shall be new, free from defects and shall be marked to identify the material, class and thickness.

D. ACCEPTANCE

Acceptance of piping materials shall be subject to strengths and quality testing in addition to inspection of the completed product. Acceptance of installed piping shall be based on inspection and leakage tests as specified herein.

1.03 SUBMITTALS

A. GENERAL

Per these specifications, the Contractor shall submit shop drawings and technical literature relating to the materials and equipment to be furnished under this section as will enable the Engineer to determine compliance with the design and arrangement of parts shown on the plans and specified herein or called for by character of this work.

B. SHOP DRAWINGS

Shop drawing requirements for pipework shall include the following:

1. Layouts and Schematics: Submit detailed installation drawings of all piping and connected equipment. The drawings shall include all fittings, valves, pipe support locations and types, seismic brace locations and types, and other appurtenances.
2. Submit data to show that the following items conform to the specification requirements:
 - a. Pipe, fittings and accessories
 - b. Pipe supports and seismic braces as required herein
 - c. Flexible couplings and flanged adapters
 - d. Valves
3. Submit certified test reports as required herein and by the referenced standard specifications.
4. Joint designs.

C. MANUALS

The Contractor shall furnish manufacturer's installation and operation manuals, bulletins and spare parts lists for all valves.

D. AFFIDAVITS

The Contractor shall furnish affidavits from the manufacturers stating that valves 4" and larger have been properly installed and tested and are ready for full time operation.

1.04 APPURTENANCES

The Contractor shall furnish and install all necessary guides, inserts, anchors and assembly bolts, washers and nuts, hangers, thrust blocks, supports, gaskets, flanges and all other appurtenant items shown on the drawings, specified or required for the proper installation and operation of the piping, devices included in or on the piping equipment, and piping accessories.

1.05 PAYMENT

The cost of all pipework associated with pump station improvements including the installation of the discharge, all utility lines and connections to the existing pipelines as

shown on the plans and as specified shall be included in the lump sum bid price for the pump station improvements and no additional allowance will be made therefor.

PART 2 - PRODUCTS

2.01 GENERAL

All materials shall be new, shall conform to these specifications and to the sizes and details shown on the plans. All materials shall be subject to test by the Contractor at the point of manufacture or at the site of the work. All materials which may fail to meet the requirements of the specifications herein referred to shall be rejected and shall be removed from the site of the work.

2.02 PIPELINE MATERIALS

A. GENERAL

Pipeline materials allowable for each pipeline are shown on the plans. The pipe and materials specified in this section include all the types of pipe materials which could be used for one or more items in the project.

B. WELDED STEEL PIPE CEMENT LINED AND COATED (WS C/C) (NOT USED)

C. STAINLESS STEEL PIPING (NOT USED)

1. GENERAL. Where indicated on the plans the Contractor shall provide Schedule 40 stainless steel piping including all pipe, fittings and welding.
2. PIPE. Stainless steel pipe shall be Type 316/316L stainless steel conforming to ASTM A 778.
3. WELDED FITTINGS. Welded stainless steel fittings shall be Type 316/316L conforming to ASTM A774. All stainless steel fittings except for 90° elbows shall be Schedule 40s. All 90° elbows shall be Schedule 80s.
4. WELDING. All welding of stainless steel shall be done by a certified welder qualified in the welding of stainless steel. All shop welding and field welds shall be done in a manner that they do not discolor or "rust."

D. DUCTILE IRON (DI) PIPE AND FITTINGS

1. GENERAL. Unless otherwise provided, wherever ductile iron pipe is shown on the plans or specified herein, it shall conform to the specifications of the manufacturer and the requirements of the current standard specifications of the American Standard Association, ANSI A21.50, insofar as they apply to the work under this contract. All ductile iron pipe, except as hereinafter noted, shall have a seal coated cement lining of one-sixteenth inch (1/16") minimum thickness for pipe up to twelve inches (12") diameter, and three-thirty-seconds inch (3/32") up to twenty-four inches (24") diameter, and one-eighth inch (1/8") above twenty-four inches (24") diameter in accordance with ANSI A21.4.

All ductile iron pipe and specials shall have bell-and-spigot ends or flanged ends as the conditions of installation require, as shown on the plans, or as specified for any particular run of pipe. Pipe and specials shall be of the diameter and class shown on the plans, or as specified. Unless otherwise noted, all ductile iron specials and fittings shall conform to ANSI A21.10 specifications.

All flanged ductile iron pipe and special casting shall conform to the Standard Specifications for Ductile Iron Pipe and Special Castings above referred to, so far as they may apply. They shall particularly relate to diameter, thickness of shell, allowable variation in diameter and thickness, marking, quality of iron and of castings; testing of materials, cleaning and shop inspection; coating; hydrostatic tests, and delivery in sound and perfect condition.

It shall be permissible, where ductile iron pipe is to be flange-connected and the lengths thereof are shorter than standard pipe lengths, to use screwed-on companion flanges. The companion flanges shall conform to the specifications for ductile iron flanges noted herein, with standard drilling and pipe threads.

2. POLYETHYLENE ENCASEMENT. Where ductile iron pipe is installed in the ground, it shall be provided with polyethylene encasement conforming to AWWA Specification C105-72. Polyethylene encasement shall be placed in accordance with the recommendations of the pipe manufacturer. Polyethylene envelopes shall be carefully placed and lapped and care shall be exercised so that soil is not placed against the pipe.
3. CLASS AND THICKNESS. All pipe shown on the plans to be of Ductile Iron (DI) shall be Class 150, unless otherwise specified. Cast Iron (CI) may be substituted for Ductile Iron (DI) providing the same class of pipe is used.
4. EXTERNAL COATING. External pipe coating shall be an asphaltic coating in accordance with ANSI/AWWA C151/A21.51 for pipe and ANSI/AWWA C110/A21.10 for fittings.
5. INTERNAL PIPE LINING. Internal pipe lining shall be Protecto 401 ceramic epoxy lining or equal.
6. JOINTS ON BURIED PIPING. Cast iron end joints shall be of the type employing a single elongated rubber gasket to effect the seal, such as the "Tyton" joint, or approved equal, with internally locking rubber ring joint to resist thrust. Mechanical joints may only be used where specifically shown on the plans.
7. JOINTS ON EXPOSED PIPING. All flanges shall be of the thickness specified in the American Standard for Flanged Fittings, ASA B16.1, Class 125, as adopted by the American Society of Mechanical Engineers. Flanges shall be accurately faced. The faces shall be coated with white lead and tallow, or other suitable preparation, and shall be properly protected during shipment and handling. They shall be at right angles with the pipe axis. All bolt holes shall straddle the vertical axis and shall be one-eighth inch (1/8") larger than the respective bolt diameters. Flanges on built-up spools shall be re-faced after mounting.

Bolts and nuts shall be made of the best quality of refined iron or mild steel and shall have sound well-fitting threads. Bolts shall be provided with hexagonal chamfered

heads and nuts. The underside of all bolt heads and nuts shall have true surfaces at right angles to the axis of the bolts. The lengths of the bolts shall be such that, after joints are made up, the bolts shall protrude through the nuts, but in no case shall they protrude more than one-half threads.

8. TESTING. The work of laying the cast iron pipes and appurtenances shall be of such a character as to leave all pipes and connections watertight. Unless otherwise noted, Class 150 lines shall be tested by the Contractor under a pressure of one hundred (100) pounds per square inch. All leaks shall be repaired and made tight while under test pressure to the satisfaction of the Engineer. The test instruments shall be furnished by the Contractor.

The Contractor shall take all necessary precautions to prevent any joints from drawing while the pipelines and their appurtenances are being tested, and at his/her own expense, repair any damage to the pipes and their appurtenances or to any structures, resulting from or caused by, these tests.

E. POLYVINYL CHLORIDE (PVC) PLASTIC PIPE AND FITTINGS WITH SOLVENT WELDED JOINTS

1. SCOPE. Plastic pipe shall be installed in the locations shown on the plans for standard wall Schedule 40 pipe and for extra heavy wall Schedule 80 pipe. Pipe supports shall be provided at spacings recommended by the manufacturer based on pipe schedules and temperature conditions of the installation. PVC piping installed underground shall be encased in not less than six (6) inches untreated rock base all around.
2. MATERIALS. PVC pressure pipe and fittings shall be Type I, normal impact, rigid polyvinyl chloride conforming to the Dept of Commerce Commercial Standard CS 207-60, or currently applicable revisions of that standard. The pipe shall be rigid, tough, lightweight, thermoplastic pipe, medium gray in color, furnished in iron pipe sizes. Fittings shall be molded of the same material as the pipe. Flanged joints shall be made with 3/16" Neoprene or plasticized PVC gaskets.
3. JOINTS. Standard wall plastic pipe (Schedule 40) shall be joined using cement-welded (slip) type fittings installed in accordance with the recommendations of the manufacturer. Extra heavy wall plastic pipe (Schedule 80) may be joined by threading, using fittings molded with American Standard Taper pipe threads.

F. POLYVINYL CHLORIDE (PVC) PLASTIC SEWER PIPE AND FITTINGS, C-900 (RUBBER RING JOINTS) (NOT USED)

G. POLYETHYLENE PIPE AND FITTINGS (HDPE PIPE) (NOT USED)

2.03 PIPE HANGARS

A. GENERAL

The Contractor shall provide pipe hangars and adjustable supports and saddles to adequately support the piping as shown in the Contract Drawings or as needed.

B. UNISTRUT

1. General: Strut shall be 1-5/8 inches wide in varying heights and welded combinations as required to meet load capacities and designs indicated on the drawings.
2. Materials and Finish: All strut, fittings and hardware shall be made of AISI Type 316 stainless steel.
3. Manufacturer: Subject to compliance with these specifications, strut systems to be installed shall be as manufactured by Cooper B-Line, Tyco Unistrut, or Engineer approved equal.

2.04 VALVES

C. GENERAL

The Contractor shall furnish and install all valves and appurtenances on the pipelines of the sewage pumping works constructed under this contract. The actual position of each valve shall be as shown on the plans or as required for the proper functioning of each section of pipeline concerned.

D. IRON BODY SWING CHECK VALVES

1. CHECK VALVES. Check valves 3" to 12" shall be APCO Series 6000 to match existing equipment (no equal), designed for working pressures of 250 pounds Cold W.O.G., non-shock and shall conform to the following Standard Specifications, latest edition:

AWWA C508-09 Swing Check Valves for Waterworks Service
ASME B-16.1 Cast Iron Pipe Flanges and Flanged Fittings, Class 125
ASME B16.5 Carbon Steel Flanges and Flanged Fittings, Class 150
A.P.I. Standard No. 6-D, for 175 lb. Pipe Line Swing Check Valves.

2. MATERIALS. Hinge pins shall be stainless steel. Metal discs shall be prevented from sticking or wedging in open positions by stops. Discs shall be mounted allowing free movement of the disc to rotate assuring uniform seat wear. Disc ring shall be Buna N. Swing check valves 4" or larger shall be provided with external lever and spring for balancing the gate appropriately to operating conditions. Provides packing gland at the hinge pin intersect with the body.
3. LAYING LENGTH. Flanged swing check valves shall conform to the following laying lengths to provide interchangeability with the City standard:

4" size	= 11.5" length
6" size	= 14" length
8" size	= 19.5" length
10" size	= 24.5" length
12" size	= 27.5" length
14" size	= 31" length

E. PLUG VALVES

1. TYPE AND MANUFACTURE. Plug valves shall be non-lubricated full port eccentric plug valves (PEF) from the Dezurik Valve Company, to match existing equipment, no equal.
2. SOURCE QUALITY CONTROL. Plug valves shall be shop tested in accordance with AWWA C504, Section 5 as follows:
 - a. Inspection: Section 5.1
 - b. Performance Tests: Section 5.2
 - c. Leakage Tests: Section 5.3
 - d. Hydrostatic Tests: Section 5.4
 - e. Proof-of-Design Tests: Section 5.5

Include with submittal package certified copies of the Proof-of-Design test reports based on Class 150A (150 psi) construction.

3. MATERIALS. Plug valves shall be constructed out of the following materials:
 - a. Plug and body: Ductile Iron, ASTM A536
 - b. Plug facing: Buna-N
 - c. Stem seal: TFE
 - d. Upper thrust bearing: TFE
 - e. Body seat: Nickel, welded overlay
 - f. Upper and lower trunnion bearings: Sleeve type, 18-8 stainless steel or bronze
4. DESIGN. Design of the valve components shall conform to the following standards:
 - a. Valve packing: AWWA C504, Section 3.7 and C507, Section 10.
 - b. Valve seats: AWWA C504, Section 3.5 and C507 paragraph 7.2.
 - c. Bearings: AWWA C504 Section 3.6 and C507 paragraphs 8.1, 8.2 and 8.5.
5. FABRICATION AND MANUFACTURE. Valve port shall have 100% area full flow design. The valve shall provide a tight shut-off at rated pressure from either direction. The valve ends shall match connecting piping. The working pressure of all plug valves shall be 150 psig.

The opening motion shall be eccentric, lifting the plug away from body seat. The valve shall be provided with fully adjustable plug position stops and multiple self-adjusting u-cup seals. The valve body shall be plainly marked to indicate seat end and the actual length shall be within 1/16" of specified or theoretical length.

6. OPERATORS. Provide operators for all valves. Valve rotation shall be counterclockwise (to the left) to open and the word "OPEN" and an arrow indicating the direction to open shall be cast on each valve body or operator.

Lever operators shall have a maximum pull of 80 lb and shall be capable of withstanding a 200 lb. pull without damage. Wrench nuts shall conform to AWWA C500, Section 19 and shall be capable of withstanding a 300 ft.-lb. torque without damage. Extension stems shall be provided where indicated on drawings, specified,

required for proper operation and for buried valves with operating units more than three (3) feet below grade. Stem guides shall be cast iron, bronze bushed and adjustable in two (2) directions. If extension stem length exceeds ten (10) feet or the weight exceeds twenty (20) pounds, the top guide shall be designed to carry the stem weight and provide a collar on the stem to bear against the thrust guide. The maximum spacing of non-rising stems shall be one hundred (100) times stem OD with a ten (10) foot maximum.

Buried valves shall be provided with a stem extending to within six inches (6") of grade. Provide spaces to center stem in valve box and provide wrench nut and T-wrench.

F. AIR RELEASE VALVES

1. TYPE AND MANUFACTURE. At the location shown on the plans, the Contractor shall furnish and install a short-bodied sewage air release valve, equivalent in design, workmanship and operating characteristics to ARI Model D-025, to match existing equipment, no equal.
2. DESIGN. The air release valve body shall have a standard 2" threaded inlet, and the valve cover shall be provided with a threaded outlet for connection to vent piping. A shutoff ball valve shall be installed on the inlet line to the air release valve.

G. VALVE SCHEDULE

Valve designations, class, type, material and manufacturer's catalog numbers are shown in the Schedule of Valves.

2.05 SCHEDULE OF VALVES

MARK NO.	CLASS	TYPE AND MATERIAL	ENDS	MANUFACTURER	OR EQUAL
AIR RELEASE VALVES					
AR-1	150	Short-Bodied Sewage Air Release Valve, Stainless Steel Body and Trim	Thrd'd	ARI Model D-025	
BALL VALVES					
B-1	1000	Type 316 Stainless Steel, PTFE Seat, Lever Operated, 3 piece	Thrd'd	McMaster-Carr	X
CHECK VALVES					
CK-1	250	D.I. Swing Check, S.S. Seat, Hinge Pin,	Flg'd	APCO CVS-250	

MARK No.	CLASS	TYPE AND MATERIAL	ENDS	MANUFACTURER	OR EQUAL
		and Trim, Outside Lever & Spring			
PLUG VALVES					
P-1	150	Eccentric w/Hycar Facing, Worm Gear Operator w/ Nut	Flg'd	DeZurik	

2.06 PRESSURE GAUGES

Pressure gauges on water or air lines shall be watertight 4½-inch diameter, Ashcroft Type 1009, or equivalent Weiss, 0 to 100 psi, or equal. All gauges shall be furnished with a glycerine filled diaphragm seal equivalent to Ashcroft 101SS, or Weiss Type 101 or equal, with 1/4-inch NPT instrument connections. A 1-inch SS ball valve shall be installed on all gauge lines.

2.07 PIPE COUPLINGS

A. GENERAL

The Contractor shall furnish and install the proper connecting pieces or transition sleeves in every case where it may become necessary to join pipes of different diameters, materials or types of joint. The connection between flanged pipelines and bell-and-spigot pipe shall be made with a standard connecting piece. The Contractor shall provide proper anchorage of the pipe to prevent pulling apart from pumping pressures or from expansion.

B. FLEXIBLE COUPLINGS FOR PRESSURE PIPES

Flexible couplings used for connection of sections of cast iron or ductile iron pipe having identical outside diameters shall be Smith-Blair Type 411, Dresser Style 40, or equal. Flexible couplings for connections of cast iron pipe having slightly different outside diameters shall be Smith-Blair Type 413, Dresser Style 162, or equal. Coupling gaskets shall be Smith-Blair Grade 60, Dresser Grade 42, or equal. Sleeve length shall be 16" minimum. Buried couplings shall have Type 316 stainless steel bolts and nuts and fusion epoxy coating per the requirements of Paragraph 2.09 of this section.

C. FLEXIBLE COUPLINGS FOR GRAVITY SEWER PIPES

Flexible couplings for connections of vitrified clay pipe and PVC pipe having different outside diameters shall be Smith-Blair Type 415, or equal. Coupling gaskets shall be Smith-Blair Grade 60, or equal. Buried couplings shall have Type 316 stainless steel bolts and nuts and fusion epoxy coating per the requirements of Paragraph 2.09 of this section. Sleeve length shall be 10" or as shown on the Plans.

D. FLANGED COUPLING ADAPTERS (FCA) FOR PRESSURE PIPE

Flanged coupling adapters shall be Smith-Blair Type 911, or equal. Coupling gaskets shall be Smith-Blair Grade 60, or equal. Couplings shall be fusion epoxy lined and coated with Skotchkote 206N and shall have Type 316 stainless steel bolts and nuts.

E. RESTRAINTS

All flexible couplings and flanged coupling adapters shall be provided with Type 316 stainless steel anchor studs or joint harness bolts and lugs to prevent joint separation, as approved by the Engineer. Restraints shall be designed for a maximum working pressure of 100 psi.

2.08 CAMLOCK COUPLINGS

Camlock couplings shall meet US Military Specification, MIL-C-27487, with respect to the casting method, materials, dimensions, tolerances, pressure ratings and inspection procedures.

2.09 WALL PENETRATION CLOSURES

A. GENERAL

Pipe to wall penetration closures shall be "Link-Seal" as manufactured by Thunderline Corporation, Belleville, MI or equal. Seals shall be modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall opening. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and nut. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide an absolutely watertight seal between the pipe and wall opening. The seal shall be constructed so as to provide electrical insulation between the pipe and wall, thus reducing chances of cathodic reaction between these two members.

B. WALL OPENING

The Contractor shall determine the required inside diameter of each individual wall opening or sleeve before ordering, fabricating or installing. The inside diameter of each wall opening shall be sized as recommended by the manufacturer to fit the pipe and Link-Seal to assure a watertight joint. Sizing (correct Link-Seal model and number of links per seal) may be obtained through the manufacturer's catalog. If pipe OD is non-standard due to coating, insulation, etc., consult Thunderline's factory for engineering assistance and recommendation before proceeding with wall opening detail.

C. INSTALLATION

The Contractor shall familiarize his/her installing personnel with the instruction bulletin which illustrates the proper procedure for installing and tightening the seal to provide a watertight pipe penetration.

D. GROUT

The outside and inside of the wall penetration shall be filled with non-shrink, non-metallic grout.

2.10 PROTECTIVE COATINGS

All metal valves, fittings, couplings, bolts and nuts buried underground shall be protected from corrosion by applying a primer, Polyken 927, or Tapecoat color primer or equal and wrapping with 35 mil polyethylene tape Polyken 930, or Tapecoat CT or equal. Surfaces shall be thoroughly cleaned before application. All coatings shall be applied in strict conformance with instructions of the manufacturer. Surfaces shall be thoroughly cleaned before application.

2.11 FUSION EPOXY COATING

A. GENERAL

Where required, cast iron and steel pipe and fittings, valves, gates and equipment shall be lined and/or coated with epoxy resin by the fluid bed process as specified hereinbelow.

B. QUALITY ASSURANCE

The Contractor shall submit the following information regarding the fusion epoxy coating process:

1. Name of the shop where fusion epoxy coating is applied shall be experienced and have all facilities and equipment necessary to handling parts, preparing surfaces to be coated, heating to proper temperature, fluidized bed curing, and reassembling parts.
2. Certification that work shall be done by personnel trained and experienced in the work of this section.
3. Written confirmation from the manufacturer of the items to be coated that the shop and personnel are authorized and approved by the manufacturer to perform the coating process on his/her items.
4. Literature fully describing the shop and manufacturer of the product shall be submitted.
5. Full instructions covering the handling and care of the coatings shall be included in the submittals.

C. MATERIALS

The lining and coating material shall be a one-part, heat curable, semi-flexible thermosetting light green epoxy resin powder designed for application on preheated surfaces by fluid bed process, Scotchkote 206N, as manufactured by 3M Company. Alternate coating equivalency test results shall be submitted to the satisfaction of the Engineer at the expense of the Contractor.

D. SURFACE PREPARATION

Metal surface shall be prepared by blasting sand or grit to a uniform white metal appearance. All rough surface or pitted areas shall be ground smooth.

E. APPLICATION

1. GENERAL. The lining and coating shall be applied within eight (8) hours of sand blasting operations. The cleaned fitting shall be preheated and maintained at the required coating temperature during the lining and coating process. Application shall be by the fluidized bed process. The finished lining and coating thickness shall be not less than 15 mils. The freshly coated fitting shall be post-heated in a suitable oven immediately following the coating application for a sufficient time to insure complete cure of the epoxy resin.
2. COATING THICKNESS. The epoxy coating and lining shall be uniform in film thickness without bare or thin spots, runs or sags, pinholes or other defects.
3. TESTS. The epoxy application shall be proven by the following tests:
 - a. Adhesion Test: (a) Immersion of a 2" x 6" sample in boiling water for four (4) hours, (b) immersion of a 2" x 6" sample in 150 degree water for ninety-six (96) hours. No signs of blisters, bubbles, peeling or other forms of separation of coating shall be found.
 - b. Wet Sponge Holiday Detector Test. The lining shall be free of pinholes as tested by low voltage wet sponge Holiday Detector.
4. CERTIFICATION. The application of the dry powder fusion epoxy resin shall be done only by experienced and skilled craftsmen. The manufacturer shall submit a certificate that the fitting meets, in all respects, the requirements of these specifications.
5. FIELD REPAIR. Coating damaged in the field shall be restored with a 100% solids room temperature curing epoxy resin, compatible with the fusion epoxy coating and applied in accordance with the recommendation of the manufacturer.

PART 3 - EXECUTION

3.01 EXCAVATING, TRENCHING AND BACKFILLING

Excavation, trenching and backfilling shall be in accordance with the requirements of Section 02200.

3.02 HANDLING PIPE AND FITTINGS

- A. Proper tools, implements and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and convenient prosecution of the work. During loading, transportation and unloading, Contractors shall take every precaution to prevent injury to any and all pipe.

- B. No pipe shall be dropped from cars or trucks nor allowed to roll down skids without proper restraining ropes. Each section of pipe shall be delivered in the field as near as practicable to the place where it is to be installed, and all bells shall be faced in the proper direction for laying. Pipe shall be distributed along the trench opposite the spoil bank within easy reach of the workers installing the pipe in the trench.
- C. Pipe shall not be rolled nor dragged on the ground. Where pipe is placed in stockpiles, it shall be neatly piled and blocked with strips between tiers and with all bells facing in the same direction. Any pipe which may have been damaged in transportation or handling shall either be repaired by the Contractor before installation to the satisfaction of the Engineer or shall be permanently removed from the job site.
- D. The site where the pipe is heat fused into longer length shall be graded level or with a uniform slope and shall be free of sharp rocks and other debris that could cut or gouge the pipe. Rollers shall be provided where the pipe must be dragged over rough ground to eliminate abrasion. For fusion welding during wet or stormy weather, shelters shall be provided by the Contractor.

3.03 PIPELINE ALIGNMENT AND GRADE

All pipelines shall be laid true to line and grade. Pipe alignment shall reasonably conform to that shown on the plans, and in no event shall joint deflections exceed the pipe manufacturer's recommendations.

3.04 INSTALLATION OF PIPELINES

A. GENERAL

1. The Contractor shall install all pipelines and appurtenances in the position and to the lines, elevations and grades shown on the plans. All pipe work shall be installed in a competent manner with all pipe runs truly parallel with vertical and horizontal axes.
2. Wherever a pipeline of any material terminates or extends at or through a structural wall or sump, the Contractor shall install, in advance of pouring concrete, the fitting or special casting required for the particular installation. Particular care shall be taken to secure full support of the pipe within the earth beyond the joint. A flexible type coupling or fitting shall be installed on all pipelines connecting to concrete structures to prevent shearing of the pipe due to settlement of earth surrounding the structure.
3. In the case of pipelines lying generally within structures, or extending from structure to structure, the Contractor shall, insofar as practicable, assemble such lines in advance of pouring concrete so that those sections passing through concrete walls may be cast monolithically in place.
4. Wherever any run of pipe is installed subsequent to pouring of concrete, the Contractor shall accurately position cored openings in the concrete for such pipelines. Openings shall be of sufficient additional diameter or size to permit a perfect final alignment of pipelines and fittings without any deflection of any part, and to allow adequate space for satisfactory caulking, where the pipe passes through the wall, to insure water tightness around openings so formed. The boxes or cores shall be provided with continuous keyways, subsequently to hold the caulking in place

against any movement of the pipe due to expansion or contraction. Cored openings shall be sealed with quick setting non-metallic hydraulic cement. The cement shall be "Waterplug," as manufactured by Standard Dry Wall Products, Inc, or equivalent. The cored opening shall be completely watertight.

5. Wherever pipelines extend through structural walls or through successive walls, or through floor or roof slab and adjacent wall, the Contractor shall provide a sufficient number of flanged joints, victaulic couplings or unions to permit the dismounting of sections of pipeline within the structure, without disturbing adjacent lines or portions within the concrete.
6. All pipe shall be carefully installed to the proper lines and grades, and where possible, shall be sloped to permit complete drainage. Unless otherwise shown on the plans, all pipe and conduits shall be placed not less than 24" below finished grade. All pipelines shall be rigidly supported by approved hangers, brackets, rod ties, thrust blocks or other devices. Screwed joints shall be made with full threads using joint compounds as herein specified. All cut ends shall be reamed to full bore before assembly.
7. In erecting the pipe, a sufficient number of unions or flanged joints shall be used to allow any section or run of pipe to be disconnected without taking down adjacent runs. Screwed or compression unions may be employed on pipe lines two and one-half inches (2½") in diameter and under. Flanged joints or victaulic couplings shall be employed on pipelines three inches (3") in diameter and over.

B. FLANGED JOINTS

1. Flanged joint cast iron pipe shall be made up by threading plain end pipe, screwing the flanges on, and machine-tightening until the pipe end protrudes past the face of the flange. The pipe end and flange shall then be faced giving a flush surface across the end of the pipe and the face of the flange. When the flanges are screwed on the pipe, a sealer shall be applied to the threaded section and completely fill the space under the skirt of the flange.
2. After facing flanges, an inspection limit of 1/16-inch will be allowed on all contact surface dimensions of full length or short length flanged pipe in sizes up to and including ten inches (10"), and plus or minus 1/8-inch on sizes larger than ten inches (10"). Screwed-on flanged pipe spools shall be made up in the shop or point of manufacture and shall not be threaded and flanged in the field.
3. Flanged joints shall be made up square, with even pressure on the gaskets, and shall be watertight. Gaskets shall be best quality asbestos composition one-sixteenth inch (1/16") thick. All gaskets shall be the full width of the face of the flanges to which they are applied.
4. Bolts and nuts shall be made of the best quality of refined iron or mild steel and shall have sound, well-fitting threads. Bolts shall be provided with hexagonal chamfered heads and nuts. The underside of all bolt heads and nuts shall have true surfaces at right angles to the axis of the bolts. The lengths of the bolts shall be such that after joints are made up, the bolts shall protrude through the nuts, but in no case shall they protrude more than one and one-half (1½) threads. An anti-seizure compound, Jet-lube, TFW Teflon, or equal, shall be used on all bolt threads.

C. CUTTING PIPE

The Contractor shall perform all work of cutting pipe and special castings necessary to the assembly, erection and completion of the work. All pipe shall be cut to fit accurately with smooth ends and faces. The Contractor shall be responsible for the correctness of cutting and shall stand the loss for any materials, which are damaged or incorrectly cut.

3.05 CLEANING

Prior to testing, the inside of each completed piping system shall be thoroughly cleaned of all dirt, loose scale, sand and other foreign material. Cleaning shall be by sweeping, flushing with water or blowing with compressed air, as appropriate for the size and type of pipe. The Contractor shall install temporary strainers, temporarily disconnect equipment, or take other appropriate measures to protect equipment while cleaning piping.

3.06 TESTING PIPE SYSTEMS

A. GENERAL

1. The work of installing pipelines and appurtenances shall be of such a character as to leave all pipes and connections watertight. As soon as practical after any section of pipeline has been completed or when directed by the Engineer, a hydrostatic test shall be placed on that section of pipe to determine water tightness.
2. The work connected with the making of these tests shall be under the direction and supervision of the Engineer. The Contractor shall furnish all the necessary labor, equipment and material, including pressure gauges, valves, pipe plugs, blind flanges and blocking or restraining tie rods to make the tests and to perform any work required thereby.
3. The Contractor shall take all necessary precautions to prevent any joints from drawing while the pipelines and their appurtenances are being tested, and he/she will, at his/her own expense, repair any damage to the pipes and their appurtenances, or of any other structures, resulting from or caused by these tests.
4. The Contractor shall take up all loose joints and shall permanently stop all leaks. All pipe or joints, which prove defective, shall be replaced, and the lines on which such defects occur shall be tested again to determine the final acceptability of the installation. Pipelines in trenches shall not be backfilled until they have been tested, as specified herein, and found satisfactory.
5. The hydrostatic pressure shall be maintained within 5 psi of the specified pressure for a duration shown. If the Contractor is unable to hold the pressure within these limits, the section being tested will be considered defective. The Contractor shall determine the cause of failure and make necessary repairs. The test shall be repeated until satisfactory to the Engineer.

New pipelines to be connected to existing lines or lines which are designed for a lesser test pressure shall be blocked off and tested prior to making the tie-in to the existing pipeline. The field connection necessary for making the closure shall be

made in the presence of the Inspector and shall be left uncovered until inspected under working pressure conditions.

B. TESTING

Tests shall be conducted in conformance with the current edition of the California Plumbing Code, with the following additional requirements:

<u>Class of Service</u>	<u>Test Requirements</u>		
	<u>Test Pressure</u>	<u>Length of Test</u>	<u>Leakage</u>
HPDE Pipe	50 psi	120 Min	None
Ductile Iron Pipe	75 psi	20 Min	None

All pressure testing shall be done with water, air testing is not allowed.

3.07 PRESERVATION AND CLEANING UP

The Contractor shall properly preserve and clean the work as it progresses. At regular intervals, or as directed, rubbish and debris shall be collected and removed by the Contractor.

Upon the completion of the work, the Contractor shall clean up the whole work, and all false work, equipment, tools, rubbish and other temporary material shall be removed from the site, which shall be left in a clean condition acceptable to the Engineer.

END OF SECTION

SECTION 15700

HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

PART 1 - GENERAL

1.01 SUMMARY

A. Work includes but is not limited to the following major items.

1. Split System Air Condensing Unit

B. Installation and startup instructions.

1.02 QUALITY ASSURANCE

A. Qualifications: Firms regularly engaged in the manufacture of HVAC equipment, of the types and capacities required.

B. Regulatory Requirements, UL and/or AGA Compliance: Provide units which are UL and/or AGA listed.

C. Regulatory Requirements:

1. Packaged Air Conditioning Units:

a. ARI 20: Unitary Air Conditioning Equipment.

b. ARI 240: Air Source Unitary Heat Pump Equipment.

c. ARI 270: Sound Rating for Outdoor Unitary Equipment.

d. ARI 365 - Commercial and Industrial Unitary Air-Conditioning Condensing Units.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, weights (shipping, installed and operating), dimensions, controls, electrical requirements, connection requirements, furnished specialties and accessories, and installation and start-up instructions.

B. O&M Manual: Submit operation and maintenance manual to owner after installation.

C. Shop Drawings: Submit manufacturer's assembly type shop drawings indicating dimensions, weight loadings, required clearances, methods of assembly of components, location and size of each field connection, arrangement and construction including bussing, and number and type of contactors employed.

D. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply to HVAC equipment. Submit manufacturer's ladder type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory installed and portions to be field installed.

E. Record Drawings: At project closeout, submit Record Drawings of installed ductwork, duct accessories, and outlets and inlets.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Comply with manufacturer's rigging and installation instructions for unloading terminal units, and installation.
- B. Protect accessories from damage during shipping, storage and handling.

1.05 WARRANTY

- A. General: Provide written warranty on HVAC work, agreeing to replace/repair inadequate and defective materials and quality of work, including leakage, breakage, improper assembly and failure to perform as required for a period of 1 year from date of Owner's acceptance. Include separate product warranties as indicated (if any) for specific parts or products in the work. Provide warranty signed by both the installer and Contractor.
- B. Include manufacturer's standard product warranty, covering HVAC equipment operation under normal conditions and use, where installed, operated and maintained in accordance with manufacturer's instructions. Provide product warranty period terminating 12 months after start-up of equipment.

PART 2- PRODUCTS

2.01 SPLIT SYSTEM AIR CONDITIONING UNITS

- A. Product Description: Split system consisting of fan coil unit and condensing unit including cabinet, evaporator fan, refrigerant cooling coil, compressor, refrigeration circuit, condenser, air filters, controls, air handling unit accessories, condensing unit accessories, and refrigeration specialties. Unit to have a minimum SEER energy efficiency rating of 15.2.
- B. Make/Model: Mitsubishi Electric, 1-ton P-Series ductless air conditioning system, indoor unit model PKA-A12HA6 and outdoor unit model PUY-A12NHA6, or equal. Includes wall mounted interior unit and outdoor unit.
- C. Refrigerant: R410A

2.02 EXTERIOR CONDENSING UNIT CAGE

- A. Product Description: Locking coated steel cage to fully enclose exterior condensing unit that allow complete access to unit once unlocked and opened. Steel cage shall be constructed for enclosing condenser units and shall be made of 16 gauge steel minimum and shall be fully coated for exterior exposure.

PART 3 - EXECUTION

3.01 VERIFICATION OF CONDITIONS

- A. Examine areas and conditions under which HVAC equipment is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Manufacturer's Supervision: Equipment manufacturer shall supervise field assembly (if any) and installation of equipment work, with factory trained technical service representative. Prepare manufacturer's written report of installation and testing, signed by representative.
 - 1. Include leak testing, evacuation, dehydration, vacuum pumping, and charging in scope of supervision by manufacturer's representative.
 - 2. Include lubrication, including filling of reservoirs, and confirming that lubricant is of quantity and type recommended by manufacturer in scope of supervision by manufacturer's representative.
 - 3. Paint damaged and abraded factory finish with touch up paint matching factory finish.
 - 4. Grounding: Provide positive electrical equipment ground for HVAC equipment and components where indicated.
- B. Air-Cooled Condensing Units: Install in accordance with manufacturer's installation instructions.
- C. Connect refrigerant piping to unit, run piping so as not to interfere with access to unit. Install furnished field mounted accessories.
- D. Equipment:
 - 1. General: Install in accordance with manufacturer's installation instructions, plumb and level, firmly anchored to vibration isolators. Maintain manufacturer's recommended clearances.
 - 2. Controls: Furnish field installed automatic temperature control requirements as indicated.
- E. Refrigerant System:
 - 1. Piping: Install all refrigerant piping per unit manufacturer's latest published recommendations straight and free from kinks and restrictions, properly supported by Trisolator or Cush-A-Strip S-715 to minimize vibration. Furnish and install straps or hangers at 5-foot spacing for 1/2 inch lines, 6-foot for 1 inch lines. Pass a slow stream of dry nitrogen through the tubing at all times while soldering to eliminate the formation of copper oxide inside the tubing.
 - 2. Slope all lines to facilitate oil return to compressor. Provide suction line traps per manufacturer's recommendations. Install refrigerant piping as shown except make modifications as recommended by the equipment unit manufacturer. Make such modifications at no cost to the Owner.
 - 3. Test piping to 150 PSI.
 - 4. After dehydration, introduce the manufacturer's recommended type and quantity of refrigerant into system through a filter/dryer.
- F. Start up: Start up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

1. Do not place equipment in sustained operation prior to initial balancing of mechanical systems.
2. Furnish sufficient refrigerant and dry nitrogen for pressure testing under manufacturer's supervision.

END OF SECTION

SECTION 16050
ELECTRICAL WORK, GENERAL

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Provide electrical work, complete and operable, in accordance with the Contract Documents.
- B. The provisions of this Section apply to all sections in Division 16, except as indicated otherwise. The work of this Section is required for operation of electrically-driven equipment provided under specifications in other Divisions. Attention is directed to the requirement for proper coordination of the work of this Section with the work of equipment specifications, and the work of Division 17.
- C. Major work shall include but is not limited to: demolition of existing Sewage Lift Station Motor Control Center (MCC) and Control Panel, demolition of existing Standby Generator, new automatic transfer switch (ATS) in existing Switchboard, new outdoor Standby Generator with radiator mounted automatic load bank, new Sewage Lift Station Pump Control Panel, new wetwell instrumentation, new SCADA workstation, new submersible pumps connected at new Termination Cabinet, new flood light pole and antenna.
- D. City Programmer, ArcSine Engineering shall provide programmable logic controller (PLC) programming, radio configuration, and SCADA Workstation configuration work, all outside of this contract. Contractor to provide 8 hours to assist with testing of field devices to new Pump control Panel PLC with confirmation to City SCADA Workstation. Contractor to provide all required Factory and Field Testing as part of these Contract Documents.
- E. All concrete, excavation, and backfill work required for encasement, installation, or construction of the work of the various sections of Division 16 is included as a part of the work under the respective sections, including ductbanks and handholes.
- F. Properly remove from site and dispose demolished equipment, per local, state and federal requirements. Remove and deliver existing Sewage Lift Station Control Panel's PLC, autodialer, level transmitter and transducer to City. Remove and deliver existing Switchboard ATS to City. Relocate existing Generator Receptacle from Sewage Lift Station MCC to outside of building.

1.2 APPLICABLE CODES AND REQUIREMENTS

- A. The work of this Section and all sections in Division 16 shall comply with the latest editions of the following:
 - 1. Title 8, Subchapter 5, California Administrative Code – Electrical Safety Orders.
 - 2. Local Laws and Ordinances.
 - 3. State and Federal Laws.
 - 4. Local and State Fire Marshal.

5. Underwriters' Laboratories (UL).
 6. National Electrical Safety Code (NESC).
 7. American National Standards Institute (ANSI).
 8. National Electrical Manufacturer's Association (NEMA).
 9. National Electrical Contractors' Association (NECA) Standard of Installation.
 10. Institute of Electrical and Electronics Engineers (IEEE).
 11. Insulated Cable Engineers Association (ICEA).
 12. Occupational Safety and Health Act (OSHA).
 13. National Electrical Testing Association (NETA).
 14. American Society for Testing and Materials (ASTM).
 15. California Electrical Code.
 16. City of Petaluma.
 17. International Building Code (IBC).
- B. All electrical equipment shall be listed by and shall bear the label of Underwriters' Laboratories, Inc. (UL), or by an independent testing laboratory acceptable to the local code enforcement agency having jurisdiction.
- C. Installation of electrical equipment and materials shall comply with Occupational Safety and Health Administration (OSHA) Safety and Health Standards, state building standards, and applicable local, state, and federal codes and regulations.
- D. Where the requirements of the specifications conflict with UL, National Electrical Manufacturers Association (NEMA), National Fire Protection Association (NFPA), or other applicable standards, the more stringent requirements shall govern as approved by the local authority having jurisdiction (City of Petaluma).

1.3 SIGNAGE

- A. Provide danger, caution, and warning signs and equipment identification markings in accordance with applicable federal, state, OSHA, and NEC requirements. Provide the following signage at a minimum, unless otherwise stated in individual equipment specifications sections.
1. Arc Flash Labels – Provide Arc Flash labels as required per NEC Article 110.16 and Section 16431. Inscribe the label with the maximum available fault current at Panelboard main breaker with the date of calculation, per NEC Article 110.24.
 2. Equipment Nameplates – Provide engraved phenolic equipment nameplates on all electrical and instrumentation equipment. Nameplate to be inscribed with equipment name and electrical capacity, at a minimum.
 3. Warning Signs: Provide signs near equipment that can start automatically, including Standby Generator to read: “Caution Equipment to Start Automatically”.

1.4 INSPECTION OF THE SITE AND EXISTING CONDITIONS

- A. Before submitting a bid, visit the site and determine conditions at the site and at all existing structures in order to become familiar with all existing conditions and electrical systems which will, in any way or manner, affect the work required under this Contract. No subsequent increase in Contract cost will be allowed for additional work required due to failure to fulfill this requirement.
- B. Protect all existing aboveground and underground utilities during construction. Pay for all repairs without increase in Contract cost should damage to underground utilities occur during construction. Restore existing site surfaces to original condition.

1.5 RESPONSIBILITY

- A. Complete systems functionally operational in accordance with the intent of these Contract Documents.
- B. Coordinating the details of facility and process equipment layouts and construction for all Specification Divisions which affect the work covered under Division 16.
- C. Furnishing and installing all incidental items not actually shown or specified, but which are required by good practice to provide complete functional systems.
- D. Coordination with other Division for equipment electrical, wiring and cable requirements.
- E. Submit a complete copy of red line as-builts every month after the Notice to Proceed in accordance with the Record Drawing requirements of Section 01330 – Submittal Procedures. At end of project, prior to final acceptance and final payment, field confirm red lined as-builts with City’s Operation and Maintenance staff. Confirmation shall review in field the installed work versus the red lined as-builts. City Operation and Maintenance staff must approve the red lined as-builts for project acceptance and payment.

1.6 INTENT OF DRAWINGS

- A. The Contract Drawings indicate the extent, general location, and arrangement of equipment. Ductbanks and conduit runs are diagrammatic and may not show the exact locations for installation. Verify the locations of conduit stub-ups based upon conduit entry space of equipment furnished from the manufacturer's certified shop drawings and by inspection of the actual equipment to be installed.
- B. In general, where the background on Contract Drawings has been screened, the area screened is work other than electrical, unless otherwise noted. Work under this Division 16 is shown heavier for contrast.

1.7 DUCTBANKS AND TRENCHES

- A. “Ductbanks” or electrical “trenches”, for non-utility conduits, shall have sand backfill and 4” concrete cap; refer to Contract Drawing details. The terms ductbank and trench are synonymous. Details applies even to under slab electrical trench installations.
- B. As-built the ductbanks. Provide physical locations with width and depth call outs, and measurement take offs from permanent structures.

1.8 CONTRACTOR SUBMITTALS

A. General

1. Provide manufacturers' descriptive information and shop drawings for all equipment, material, and devices furnished under Division 16. Submit Schematic (control) Diagrams, equipment dimensional drawings with panel elevations and layouts, Interconnect Diagrams, instrument installation details, catalog cut sheet information, nameplate schedules, and calculations in accordance with Section 01330 – Submittal Procedures and this Section. Device designations and symbols for Schematic (Control) Diagrams and Interconnect Diagrams shall conform to the latest edition of NEMA ICS 1.
2. Submit complete electrical drawings for all equipment furnished in accordance. These drawings shall contain panel elevation, bill of materials, control schematic diagrams (complete with terminal numbers, device names, field equipment tag numbers) to provide complete identification of the circuits and provide coordination between the equipment. Both AutoCAD (version per City) and PDF-type files are required.
3. Submit Interconnect Diagrams for all new cables installed, except lighting and receptacles. Interconnect Diagrams shall represent: Standby Generator, Pump Control Panel, ATS, existing Storm Drain Pump Station MCC and panelboard and PLC, antenna, Termination Cabinet, wet well equipment, and SCADA Workstation. Refer to Section 17100 – Process Control and Instrumentation Systems for details of Interconnect Diagrams.
4. Submit listing of equipment nameplates complete with inscriptions for review.
5. Check submittals for proper number of copies, adequate identification, correctness and compliance with Drawings and Specifications.
6. Operation and Maintenance (O&M) Manuals.

B. Submit certified shop drawings and diagrams as follows:

1. Layouts indicating conformity with space requirements, including access requirements.
2. Detailed anchoring requirements providing anchor type, size, and min embedment.
3. Assembly drawings in sufficient detail to identify every part of the specified equipment, including bills of material.
4. General dimension, outline, and panel, section, and structure layout drawings showing the principal dimensions of the equipment, the location of all devices therein, and the size of electrical conduit windows and cable connections. Include front, rear, side elevations and top view. Include access requirements. Provide finish and materials, temperature limitations, and grounding requirements. Provide nameplate inscription schedule. Provide manufacturer anchoring requirements to confirm seismic results and equipment weights.

1.9 AREA DESIGNATIONS

A. General

1. Raceway system and pull boxes shall comply with Sections 16110 and 16111.
2. Table 1 lists the type of electrical equipment and materials to be used based on applied area in Table 2.

Table 1 Electrical Equipment and Materials					
Applied Area Classification	Enclosure, Pullbox or JBox NEMA Rating	Enclosures / Device Boxes	Strut and Mounting Hardware	Exposed Conduit, Fittings, and Condulets	Underground Conduit System
Interior General	NEMA 12	Painted Steel / Cast Steel	304 Stainless Steel	Galvanized Rigid Steel	N/A
Interior Corrosive and Class 1, Div 1	N/A	Not Allowed	304 Stainless Steel	PVC Sch 40 Non-Metallic, or Stainless Steel	N/A
Exterior Wet	NEMA 4, 3R	Painted Steel / Cast Steel	316 Stainless Steel	PVC Coated Galvanized Rigid Steel	PVC Sch 40 Non-Metallic
Exterior Corrosive and Class 1, Div 2	NEMA 4X	Stainless Steel	316 Stainless Steel	PVC Coated Galvanized Rigid Steel, or Stainless Steel	PVC Sch 40 Non-Metallic

3. The following (Table 2) identifies area classifications.

Table 2 Areas Classifications By Building/Facility and Room		
Building/Facility	Room	Area Classification
Sewage Wetwell	Interior of Sewage Wetwell	Interior Corrosive and Class 1, Div 1, Group D
	Outside of Sewage Wetwell up to 18" high and extended 3' from hatch edge	Exterior Corrosive and Class 1, Div 2
Valve Vault	Interior of Vault and up to hatch edge	Exterior Corrosive and Class 1, Div 2
	Outside of Vault	Exterior Wet
Control Building	Interior of Control Building	Interior General
	Exterior of Control Building	Exterior Wet
General Site	All exterior Site Areas not otherwise designated	Exterior Wet

4. Installations in hazardous locations shall conform strictly to the requirements of the National Electrical Code and NFPA 820.

B. Material Requirements

1. NEMA 4 or 4X enclosures shall be 316 stainless steel.

1.10 TESTS

- A. Furnish all necessary testing equipment and pay all costs of tests, including all replacement parts and labor, due to damage resulting from damaged equipment or from testing and correction of faulty installation.
- B. Factory Acceptance Testing of Pump Control Panel shall take place within 100 miles of project site. If Factory Acceptance Testing is greater than 100 miles from project site, provide \$1000 in bid to cover City and Engineer traveling expenses.
- C. All test forms shall be submitted and approved prior to scheduling testing.
- D. Provide a minimum of two weeks notification of Field Tests to the Engineer. Field Tests shall be witnessed and signed off by the Engineer in order to be considered valid.
- E. NETA testing to be performed prior to energizing equipment by submitted and approved third party, NETA certified testing agency. Refer to Specification Section 16950.

1.11 TEMPORARY LIGHTING

- A. Provide temporary power and lighting in accordance with NEC Article 590. The average lighting level (foot-candle) shall meet OSHA 1926.56 and CAL-OSHA requirements.

1.12 DEFINITIONS (APPLICABLE TO SPECIFICATIONS AND DRAWINGS)

- A. Above Grade – Not buried in ground and not embedded in concrete slab on ground.
- B. Below Grade – Buried in ground and below slabs as applicable, and not embedded within concrete slab on ground.
- C. Certified – Confirmed to be accurate, or as represented, or as meeting standards.
- D. Concealed – In general, any item not visible or directly accessible.
- E. Connect – Complete hookup of item with required services, including conduits, wires, and other accessories.
- F. Exposed – Either visible or subject to mechanical or weather damage, indoor or outdoor, include areas such as mechanical and storage rooms. In general, any item that is directly accessible without removing walls, panels, ceilings or other parts of structure.
- G. Underground – Buried in ground, including under building slabs.
- H. Wiring – Electrical conduit, raceway, conductors and connections.

1.13 WARRANTY

- A. The warranty for all provided equipment shall be not less than one year after approved and witnessed startup and receipt of approved as-built drawings and O&M Manuals, or City beneficial use, whichever is later.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All equipment and materials shall be new, shall be listed by UL, and shall bear the UL label where UL requirements apply. All equipment and materials shall be the products of experienced and reputable manufacturers in the industry. Similar items in the work shall be products of the same manufacturer. All equipment and materials shall be of industrial grade standard of construction.
- B. Where a NEMA enclosure type is indicated in a non-hazardous location, utilize that type of enclosure, despite the fact that certain modifications such as cutouts for control devices may negate the NEMA rating.

2.2 MOUNTING HARDWARE

- A. Miscellaneous Hardware
 - 1. All nuts, bolts, and washers shall be 316 stainless steel, unless called out otherwise.
 - 2. Strut materials shall be per Table 1 – Area Designations.
 - 3. Where contact with concrete or dissimilar metals may cause galvanic corrosion, suitable non-metallic insulators shall be utilized to prevent such corrosion.
 - 4. Anchors for attaching equipment to concrete floors and slab on grade, shall be 316 stainless steel chemical anchors.

2.3 SCADA WORKSTATION ALLOWANCE AND PROCUREMENT

- A. Contractor shall provide \$10,000 in bid for SCADA Workstation. City Programmer, ArcSine Engineering, shall provide make and model of SCADA Workstation within 30 days of Notice to Proceed, for Contractor procurement of SCADA Workstation hardware and software. Contractor shall utilize \$10,000 for purchase of SCADA Workstation hardware and software and provide within 90 days after Notice to Proceed. Bid allowance does not include profit, overhead, mark-ups or bonding; these items shall be added on top of allowance as required by Contractor.
- B. Deliver SCADA Workstation hardware and software to ArcSine Engineering, Attention Ms. Kendra Bradley, City to provide address for delivery. Refer to Section 17100 – Process Control and Instrumentation Systems. Contractor to request addressee prior to shipping.

2.4 EXISTING SWITCHBOARD AUTOMATIC TRANSFER SWITCH MODIFICATIONS

- A. Existing Switchboard has an existing automatic transfer switch (ATS) and controller that shall be removed and provided to the City. Contractor shall remove the existing ATS system complete, including all ATS interconnecting cables, and deliver to City. Existing ATS is ASCO #J03ATSA30400NGXF 400 Amp, 3 pole.
- B. Coordinate with City to schedule shutdown for ATS removal and installation of new ATS. Provide two week notice for City approval of shutdown. Shutdown schedule shall be limited between Tuesdays thru Thursdays, 9:00 am to 3:00 pm. Shutdown duration shall not exceed six hours. Contractor shall provide temporary back up power source to power sewage lift station during shut down.

- C. Deliver existing ATS to City's corporation yard, 840 Hopper St, Petaluma, CA. Provide means for removal of equipment.

2.5 EXISTING TELEPHONE SYSTEM MODIFICATIONS

- A. Contractor shall modify the existing utility telephone system by extending the telephones service from the existing minimum point of entrance (MPOE) to the new autodialer within the new Pump Control Panel.

2.6 ELECTRICAL IDENTIFICATION

- A. All conduits, and individual wires shall be labeled. All terminal blocks shall be labeled.
- B. All equipment, control devices, and panels shall include nameplate with description and tag number.

2.7 TEMPERATURE RATINGS

- A. Provide equipment and devices to be installed outdoors capable of continuous operation within an ambient temperature range of 0° C to 40° C. Equipment must be capable of proper operation at rated output continuously in this ambient temperature range in direct sun.

PART 3 - EXECUTION

3.1 GENERAL

- A. Incidentals: Provide all materials and incidentals required for a complete and operable system, even if not required explicitly by the Specifications or the Drawings.
- B. Field Control of Location and Arrangement: The Drawings diagrammatically indicate the location and arrangement of conduit runs, equipment, and other items. Exact locations shall be determined based on the physical size and arrangement of equipment, finished elevations, and other obstructions.
 - 1. Where "home runs" are shown, route the conduits in accordance with the indicated installation requirements. Routings shall be exposed or encased as indicated.
 - 2. All conduit and equipment shall be installed in such a manner as to avoid all obstructions and to preserve working clearances and keep openings and passageways clear.
- C. Workmanship: All materials and equipment shall be installed in strict accordance with the printed recommendations of the manufacturer. Installation shall be accomplished by workers skilled in the work. Installation shall be coordinated in the field with other trades to avoid interferences.
- D. Protection of Equipment and Materials: Protect all materials and equipment against damage from any cause. All materials and equipment, both in storage and during construction, shall be covered in such a manner that no finished surfaces will be damaged, marred, or splattered with water, foam, dust, dirt, plaster, or paint. All moving parts shall be kept clean and dry. Replace or refinish all damaged materials or equipment, including face plates of panels, at no additional expense to the contract.

- E. Label and cap all spare conduits. Include pull tape in all spare conduits.

3.2 EQUIPMENT ANCHORING

- A. Floor-supported equipment and conduits shall be anchored in place by methods that will meet project specific seismic requirements, and per local, state, and International Building Code requirements. Submit anchoring calculations for approval for the Standby Generator, Termination Cabinet, and Pump Control Panel.
- B. Anchoring methods and leveling criteria specified in the printed recommendations of the equipment manufacturers are a part of the work of this Contract. Such recommendations shall be submitted as shop drawings.

3.3 EQUIPMENT IDENTIFICATION

- A. General: Equipment and Devices shall be Identified as Follows:
 - 1. Nameplates shall be provided for all equipment and instruments. Equipment description and equipment tag number noted on Drawings, and electrical power source shall be utilized on all nameplates. If no tag number is given, assign and submit a number for approval.
 - 2. All conduits and cables shall be labeled. Provide conduit tag, and wire tag label inscriptions. If no tag number is given, assign and submit a number for approval.
 - 3. Furnish typewritten circuit directories for panelboard, even if existing; the circuit directory shall accurately reflect the load description connected to each circuit.

3.4 CUTTING AND PATCHING

- A. Lay out work carefully in advance. Do not cut, drill, or notch any structural member or building surface without the specific approval of the Engineer. Carefully carry out any cutting, channeling, chasing, or drilling of floors, walls, paving, or other surfaces required for the installation, support, or anchorage of conduit, raceways, or other electrical materials and equipment. Following such work, restore surfaces neatly to original condition.

3.5 LOAD BALANCE

- A. The Contract Drawings and Specifications indicate circuiting to electrical loads and distribution equipment. Balance electrical load between phases as nearly as possible on panelboards.

3.6 CLEANING AND TOUCHUP PAINTING

- A. Keep the premises free from an accumulation of waste material or rubbish. Upon completion of the work, remove all materials, scraps, and debris from the premises and from the interior and exterior of all devices and equipment. Touch up scratches, scrapes, or chips in interior and exterior surfaces of devices and equipment with finishes matching as nearly as possible the type, color, consistency, and surface of the original finish. If extensive damage is done to equipment paint surfaces, refinish the entire equipment in a manner that provides a finish equal to or better than the factory finish, that meets the requirements of the Specifications, and that is acceptable to the Engineer.

- B. The interior of all electrical equipment, panels, enclosures and Control Building, shall be vacuumed and wiped free of dust just before final acceptance.

3.7 INSPECTION

- A. Allow materials, equipment, and workmanship to be inspected at any time by the Engineer and City or their representatives.
- B. Correct the work, materials, or equipment not in accordance with these Contract Documents or found to be deficient or defective in a manner satisfactory to the Engineer.

3.8 OPERATION AND MAINTENANCE MANUALS

- A. Provide Operation and Maintenance Manuals in hard cover, 3-ring binders, separately bound volumes, number as required to accommodate material 8½-inch x 11-inch for text and 11-inch x 17-inch half-sized drawings and also in accordance with provisions of Section 01782. Provide the number of copies specified. Electrical and Instrumentation O&Ms shall include the following as a minimum:
 - 1. Operation, maintenance, recommended spare parts, and renewal parts information for all equipment furnished under this Section.
 - 2. Set of complete, final, as-reviewed and accepted manufacturer's or vendor's descriptive information.
 - 3. As-built electric schematics, equipment, elevations, layouts, and installation drawings showing equipment as it was actually installed and connected. Provide PDF and AutoCAD formats on disk within O&Ms.
 - 4. Index of all equipment suppliers with a list of current names, addresses, and telephone numbers of those who should be contacted for service, information, and assistance.
 - 5. All Factory and Field Test results.
 - 6. Information listed under individual specification submittal requirements.
 - 7. Complete facility Interconnect Diagrams for all equipment except lighting and receptacles. Show field wiring from equipment origin numbered terminal to destination numbered terminal in block diagram format. Include wire labels, cable labels, conduit numbers, handholes, junction boxes, etc.

3.9 RECORD DRAWINGS

- A. Provide two sets of full-sized marked-up as-built Contract Drawings in accordance with specifications. Show all departures from original Drawings, underground cable, conduit, or duct runs dimensioned from established structures, and all electrical work revisions. As-built drawings shall be initialed by the Engineer prior to submission for drafting. Obtain two new, clean sets of Contract Drawings for as-built production after each as-built submittal.

3.10 SERVICE CONTINUITY, START-UP AND SHUTDOWNS

- A. Make no outages without the prior written authorization of the Engineer. Include all costs for temporary wiring and overtime work required in the Contract price. Remove all temporary wiring at the completion of the work. Shutdowns and startups shall be scheduled two weeks in advance, upon approval from the City and Engineer. Schedule of shutdowns and startups shall be limited between Tuesday and Thursday from 9:00 a.m. to 3:00 p.m., unless prior approval has been given from the City and Engineer.

3.11 TESTING

- A. All testing shall be witnessed by the Engineer. All testing sheets shall be signed off by the Engineer to be considered valid.
- B. Perform miscellaneous electrical testing and provide results to third party testing organization for evaluation and inclusion in testing submittal.
 - 1. Miscellaneous Testing:
 - a. Demonstrate that loads are powered by named breaker per schedule and drawings.
 - b. Test Ground Fault Circuit Interrupter (GFCI) receptacles.
- C. Pre Demonstration period for electrical work shall include Factory Acceptance Testing, Manufacturer certification, Instrumentation Supplier certification, NETA Field Testing, equipment start-up, instrumentation simulation, PLC inputs/outputs and SCADA verification (with City), approval of electrical and instrumentation O&M Manuals, and electrical and instrumentation training.
- D. Demonstration period for electrical work shall include 7-day functional testing of sewage lift station pumping system.

END OF SECTION

SECTION 16110
ELECTRICAL RACEWAY SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Provide electrical raceway systems, complete and in place, in accordance with the Contract Documents.
- B. The Contractor shall provide electrical raceway systems sized for submitted and approved cables, including vendor supplied cables, or ultimate equipment size, based on the National Electrical Code or as shown on Contract Drawings, whichever is larger.

1.2 CONTRACTOR SUBMITTALS

- A. General: Submittals shall be furnished in accordance with Section 16050 – Electrical Work, General.
- B. Shop Drawings: Complete catalog cuts of all raceways, fittings, boxes, supports, and mounting hardware, marked where applicable to show proposed materials and finishes.
- C. Conduit Tags: Submit tag materials for approval.

1.3 QUALITY ASSURANCE

- A. Seismic Design Requirements: All raceway systems to be furnished under this Section shall be designed and constructed to meet the seismic requirements of Section 16050 – Electrical Work, General.
- B. Demonstrate to the Engineer that the approved manufacturer's recommended installation tools and methods are being utilized on the job site by all persons engaged in the installation of PVC-coated rigid steel conduit, elbows, nipples, and fittings. These tools and methods shall include, but not be limited to, clamp inserts for use on power-driven units of chain vises, new die heads and enlarged pipe guides in conduit threading machines, and strap wrenches and extra wide wrench jaws for use in conduit assembly.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Pull and junction boxes, fittings, and other indicated enclosures which are dedicated to the raceway system, shall comply with the requirements of this Section.
- B. Set screw type couplings, bushings, elbows, nipples and other fittings are not allowed.
- C. No conduit shall be smaller than ¾-inch. All underground conduits shall be a minimum of 1-inch.
- D. Conduits containing manufacturer cables shall be sized based on approved manufacturer cable at minimum 40-percent fill, unless approved by the Engineer.

2.2 CONDUIT

- A. Rigid Non-Metallic (PVC) Conduits
 - 1. Rigid non-metallic conduit shall be Schedule 80 PVC, 90 degrees Celsius rated, heavy duty type, UL listed. Conduit shall be manufactured in accordance with NEMA TC-2 - Electrical Plastic Tubing and Conduit, and UL-651 - Standard for Rigid Non-metallic Conduit.
 - 2. Manufacturer shall be PW Eagle, Carlon, or approved equal.
- B. Rigid PVC Coated Galvanized Steel (PVC-RGS) Conduit
 - 1. A PVC coating shall be bonded to the outer surface of the galvanized conduit. The bond between the coating and the conduit surface shall be greater than the tensile strength of the coating.
 - 2. PVC coating thickness shall be not less than 40 mils. Interior coating shall be minimum 2 mil urethane. All male threads on conduit, elbows and nipples shall be protected by urethane coating.
 - 3. PVC-RGS shall be manufactured in accordance with the following standards: UL-6, ANSI C80.1, NEMA RN1 – PVC Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit, and Federal Specification WW-C-581E.
 - 4. Conduits shall be suitable for conductors with 75° C insulation.
 - 5. Manufacturers:
 - a. Robroy Plasti-Bond Red
 - b. Occidental Coating Company OCAL-Blue Double-Coat
 - c. Perma-Cote Industries Supreme Conduit
- C. Rigid Galvanized Steel (RGS) Conduit
 - 1. Rigid steel conduit shall be manufactured from mild steel, hot-dip galvanized inside and out. Provide rigid steel conduits manufactured in accordance with NEMA C80.1 – Electrical Rigid Steel Conduit, and UL-6 – Electrical Rigid Metal Conduit - Steel.
 - 2. Manufacturers, or equal:
 - a. Allied Tube and Conduit
 - b. Wheatland Tube
- D. Stainless Steel (SSC) Conduit
 - 1. Stainless steel conduits, couplings, and fittings shall be UL listed manufactured with 316 grade stainless steel.
 - 2. Manufacturers, or equal:
 - a. Crouse-Hinds RCOND xxx 316SS, RCxxx316SS
- E. Liquidtight Flexible Metal Conduit
 - 1. Liquidtight flexible metal conduit shall be constructed of a flexible galvanized metal core with a sunlight resistant thermoplastic outer jacket.
 - 2. Liquidtight flexible metal conduit shall be manufactured in accordance with UL-360 - Steel Conduits, Liquid-Tight Flexible.

3. Conduits shall have insulated throat and stainless-steel sealing O-ring.
4. Manufacturers, or equal:
 - a. Anaconda, "Sealtite" Type UA
 - b. Electriflex, "Liquatite" Type LA
- F. Nonmetallic Tubing Conduit
 1. Nonmetallic tubing conduit shall be flexible raceway, made from thermoplastic material. Tubing shall be per NEC Article 362. Provide blue color tubing to designate power conductors.
 2. Manufacturers, or equal:
 - a. Carlon #12005
- G. Electrical Metallic Tubing and Intermediate Metallic Conduit will not be accepted.

2.3 FITTINGS AND CONDUIT BODIES

- A. General
 1. All cast and malleable iron fittings for use with metallic conduit shall be the threaded type with five full threads.
 2. All fittings and conduit bodies shall have neoprene gaskets and non-magnetic stainless steel screws. All covers shall be attached by means of holes tapped into the body of the fitting. Covers for fittings attached by means of clips or clamps will not be allowed.
 3. Conduit, fittings, and conduit bodies in hazardous locations shall be suitable for the Class and Division indicated.
- B. Fittings for Liquidtight Flexible Metal Conduit
 1. Liquidtight flexible metal conduit fittings 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. Straight, 45 degree and 90 degree fittings shall be used where applicable.
 2. For areas designed as corrosive, use galvanized steel-insulated throat connectors for liquid-tight flexible metal conduit, suitable for use in wet locations, with a minimum 40 mil PVC exterior coating and pressure sealing sleeves. Acceptable products include: Robroy Plasti-Bond Red Liquid-tight Connectors, Occidental Coating Company OCAL-Blue Double-Coat Sealtight Connectors, Perma-Cote Industries Supreme Liquid-tight Connectors, or equal.
- C. Fittings and Conduit Bodies for PVC
 1. All fittings for use with rigid non-metallic conduit shall be per PG&E requirements.
- D. Fittings and Conduit Bodies for PVC Coated Rigid Steel Conduit and Rigid Galvanized Steel Conduit
 1. Use insulated throat grounding bushings. Provide threaded zinc-plated malleable iron grounding bushings with bonding screw and insulated throat rated for 150° C. Acceptable

products include: Thomas & Betts Grounding and Bonding Bushings, OZ Gedney Type BLG, Appleton Threaded Grounding Bushings, or equal.

2. Watertight and corrosion resistant hubs for PVC Coated Rigid Steel conduit shall have a minimum 40 mil PVC exterior coating, a urethane interior coating, and pressure sealing sleeves. Acceptable products include: Robroy Plasti-Bond Red Type ST Hub, Perma-Cote Industries Supreme Type ST Hub, Occidental Coating Company OCAL-Blue Double-Coat Type ST Hub, or equal.
3. For conduit bodies for use with steel conduits, size as required by the NEC, use cast iron conduit bodies and covers with captive stainless-steel screws. If conduit body is threaded to a PVC Coated Rigid Steel conduit provide conduit body with a 40 mil minimum PVC exterior coating and nominal 2 mil internal urethane coating, and pressure sealing sleeves on all conduit openings. Acceptable products include: Robroy Plasti-Bond Red Form 8 Conduit Bodies, Occidental Coating Company OCAL-Blue Double-Coat Form 8 Conduit Bodies, Perma-Cote Industries Supreme Form 8 Conduit Bodies, or equal.

2.4 JUNCTION AND PULL BOXES

- A. Junction and pull boxes shall be provided as required to make the installation in accordance with NEC. Size junction and pull boxes in accordance with the NEC for the number of conductors enclosed in the box.
- B. Where outlet boxes are used as junction or pull boxes, use materials as specified in Section 16140 – Wiring Devices
- C. Where boxes larger than outlet or device boxes are required for junction or pull boxes, provide the following:
 1. Utilize NEMA 4 or 4X watertight and raintight enclosures for outdoor locations or where the subscript WP (weatherproof) is indicated at the box location on the Drawings. Furnish 14-gauge or 16-gauge stainless-steel enclosures with continuously welded seams, continuous door hinge, external fast operating clamp cover, external mounting feet, oil-resistant gasket and adhesive, and a polyester powder coating inside and outside. Acceptable products include: Hoffman Bulletin A51S Boxes, or equal.

2.5 CONDUIT TAGS

- A. Provide permanent, stainless steel 2-inch diameter conduit tags with conduit number pressure stamped onto the tag. Conduit numbers shall be 1/2-inch minimum. Tags relying on adhesives or taped-on markers are not acceptable.
- B. Conduit tags in underground installations like handholes, wetwell, shall be 2” diameter engraved black phenolic tags, with 1/2-inch white lettering.

2.6 SUPPORTS AND FITTINGS

- A. Strut and mounting hardware shall be per Table 1 in Section 16050 – Electrical Work, General.
- B. Strut and mounting hardware shall be sized to meet seismic requirements.

- C. All supports and fittings shall be of same material as conduit, including pipe straps, clamp back spacers, beam clamps, and other supports and fittings. Bolts and hardware shall be stainless steel. For example if conduits are PVC coated galvanized rigid steel, all conduit clamp back spacers shall be PVC coated galvanized rigid steel.

2.7 CONDUIT PENETRATION SEALS AND SLEEVES

- A. Conduit penetration seals shall be a modular, mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the conduit and the opening. The elastomeric element shall be sized and selected per the manufacturer's recommendations and shall be suitable for use in standard service applications.
- B. Acceptable products include: Thunderline Corporation Link-Seal, or equal.

2.8 DUCT SEAL

- A. Duct seal shall be a non-hardening compound designed as a waterstop and moisture barrier for sealing the annular space between conduit and electrical conductors and cables.
- B. Acceptable products include: O-Z Gedney DUX, or equal.

2.9 PULL TAPE

- A. Pull tape shall be ½-inch in width, suitable for 1,250 pounds of pull strength.
- B. Acceptable products include: Neptco Muletape WP1250P, or equal.

PART 3 - EXECUTION

3.1 GENERAL

- A. Raceway systems shall be electrically and mechanically complete before conductors are installed. Bends and offsets shall be smooth and symmetrical, and shall be accomplished with tools designed for this purpose. Factory elbows shall be utilized wherever possible.
- B. Raceway sizes shown on Drawings are minimum dimensions based on designed equipment.
- C. Conduits located underground shall be installed per Section 16111 – Underground Raceway Systems.
- D. Where raceways are indicated but routing is not shown, such as home runs or on conduit schedules; raceway routing shall be in accordance with the NEC.
- E. Routings shall be adjusted to avoid obstructions. Coordinate with all other trades prior to installation of raceways. Lack of such coordination shall not be justification for extra compensation, and removal and re-installation to resolve conflicts shall be at no extra cost to the City.
- F. Wherever contact with concrete or dissimilar metals can produce galvanic corrosion of equipment, suitable insulating means shall be provided to prevent such corrosion.
- G. Support

1. Support raceways at intervals not exceeding NEC requirements unless otherwise indicated. Support all raceways from structural members only.
 2. Support flexible metal conduit with conduit clamps.
- H. Bends
1. Make changes in the direction of runs with symmetrical bends or PVC coated cast metal fittings. Make bends and offsets of the longest practical radius. Avoid field-made bends and offsets where possible; but, where necessary, make with an acceptable hickey or conduit bending machine.
 2. Make bends in parallel or banked runs of raceways from the same center or centerline so that bends are parallel and of neat appearance. Factory elbows may be used in parallel or banked raceways if there is a change in the plane of the run and the raceways are of the same size. Otherwise, make field bends in parallel runs.
 3. Make no bends in flexible conduit that exceed allowable bending radius of the cable to be installed or that significantly restricts the conduits flexibility.
- I. Insulated Throat Grounding Bushings and Conduit to Enclosure Connections
1. Where conduit enters metal enclosure install insulated throat grounding hub. Install a bonding jumper from the bushing to equipment ground bus or ground pad. Interconnection of bonding jumpers from each conduit grounding bushing to the equipment ground bus or ground pad is acceptable. If neither a ground bus or ground pad exists, connect the bonding jumper to the metallic enclosure with a bolted-lug connection.
 2. All NEMA 4 and 4X enclosures without integral watertight hubs shall be connected with insulated throat grounding hubs. The conduit connections shall maintain the integrity of the enclosure NEMA rating. Liquid-tight PVC jacketed flexible metal conduit connections shall be corrosive resistant, watertight hub.
- J. PVC Coated Rigid Steel Conduit: Install in strict accordance with the manufacturer's instructions. Touch up any damage to the coating with conduit manufacturer acceptable patching compound. PVC boot shall cover all threads. Leave no metallic threads uncovered. Clean field threads with solvent and coat with urethane touch-up.
- K. All conduits leaving the Pump Control Panel, Standby Generator, or Termination Cabinet, shall be sealed with duct seal compound to prevent the entrance into or exit from the structure with gases, liquids, or rodents.

3.2 CONDUIT

- A. All exposed conduit shall be as noted in Area Designations per Specification 16050.
- B. PVC coated RGS factory elbows shall be utilized for transition from underground concrete ductbank to exposed conduit.
- C. All threads shall be coated with a conductive lubricant before assembly. Acceptable products include: Appleton Type TLC, Thomas & Better KOPR-Shield, or equal.
- D. Joints shall be tight, thoroughly grounded, secure, and free of obstructions in the pipe. All conduits shall be adequately reamed to prevent damage to the wires and cables inside. Strap

wrenches and vises shall be used to install conduits to prevent wrench marks on the conduits. Conduits with wrench marks shall be replaced at no additional cost.

3.3 REQUIRED RACEWAY TYPE FOR SPECIAL LOCATIONS AND INSTALLATION METHOD

- A. Provide PVC coated GRS conduits and fittings at Class 1, Division 1 and Division 2 classified areas where conduit is exposed beyond wall of area. Refer to National Electrical Code Article 500 for further raceway requirements. Size conduits per NEC based on submitted and approved manufacturer cable, or as shown on Contract Drawing, whichever is larger.
- B. Final Connection to Certain Equipment: Make final connection to motors, instrumentation, and other equipment where flexible connection is required to facilitate removal or adjustment of equipment with liquidtight flexible metal conduit. Liquidtight flexible metal conduit shall be of 12-inch minimum to 24-inch maximum lengths, unless otherwise approved by the Engineer.

3.4 PREPARATION FOR PULLING IN CONDUCTORS

- A. Ream all raceways, remove burrs, and clean raceway interiors. Immediately after installation, plug or cap all raceway ends with watertight and dust-tight seals.
- B. Pull a bristle brush and then mandrel through each raceway to remove any debris and clean raceway prior to pulling conductors. The diameter of the mandrel shall be approximately ¼ inch less than the raceway inside diameter, through each raceway. For conduits one inch and less, pull a rag through to clean and remove debris prior to pulling conductors.
- C. For all raceways which contain less than 50 percent of the NEC allowed fill, install a pull tape along with the conductors. Provide detectable pull tape in all fiber conduits.

3.5 EMPTY RACEWAYS

- A. Certain raceways will have no conductors pulled in as part of this Contract. Identify with conduit tags at each end and at any intermediate pull point of each such empty raceway. Provide a removal cap over each end of empty raceways. Provide a pull tape in each empty raceway.

3.6 JUNCTION AND PULL BOXES

- A. Where indicated on the Contract Drawings, or where necessary, redirect multiple conduit and cable runs and provide and install appropriately-sized junction boxes. Furnish and install pull boxes where necessary in the raceway system to facilitate conductor installation.
- B. Make all boxes accessible. Do not install boxes in finished areas unless accepted in writing by the Engineer. Mount all boxes plumb and level.
- C. Conduit bodies maybe used for junction or pull boxes as long as sized for installation.

3.7 ELECTRICAL CONTINUITY

- A. The entire electrical raceway system shall form a continuous metallic electrical conductor from the service point to every load, and shall be grounded by connection to the main service ground.
- B. Rigid steel conduits shall have threads coated with conductive sealant before screwing into fittings.
- C. An equipment grounding conductor shall be installed in all conduits. Conduits shall not be substituted for the equipment grounding wire. Bond together the conduit system, enclosures, grounding system, and equipment bus bars.

3.8 CONDUIT IDENTIFICATION

- A. All conduits shall be identified with minimum of two tags, one at each end. In addition, all conduits shall be tagged at intermediate pull points like cabinets, handholes or pull boxes. Use correct type of tag based on installed location. Tags shall be inscribed as designated on the Contract Drawing Conduit and Cable Schedule and per approved Interconnect Diagrams.
- B. Exposed and Above Grade Conduits: Attach conduit tags to conduits with 316 stainless steel tie wire at end of the conduit.
- C. Conduits shall be tagged prior to Field Testing.

END OF SECTION

SECTION 16111
UNDERGROUND RACEWAY SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Provide underground raceway systems, complete and in place, in accordance with the Contract Documents.
- B. The Contractor shall provide underground raceway systems sized for submitted and approved cables, including vendor supplied cables, or ultimate equipment size, or as shown on Contract Drawings, whichever is larger. Conduit sizes shall be as required by National Electrical Code

1.2 CONTRACTOR SUBMITTALS

- A. General: Submittals shall be furnished in accordance with Section 16050 – Electrical Work, General.
- B. Shop Drawings: Complete catalog cuts of all underground raceway systems, including handholes, conduits, ductbanks, trenches, spacers, etc.
- C. Conduit Tags: Submit tag materials for approval. Refer to Section 16110 – Electrical Raceway Systems.
- D. Underground Raceway System shall be documented to be submitted and approved as-builts for record drawings. Refer to Section 16050 – Electric Work, General.
- E. Provide surveyed as-built drawings of all installed ductbanks providing top-of-ductbank elevation, ductbank width, handholes, and routing. Include cross-section information for all ductbank sections.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Handholes, conduits and fittings which are dedicated to the underground raceway system shall comply with the requirements of this Section. Contractor shall provide handholes, even if not shown on Drawings, to facilitate cable pulling. Provide separate handholes for “A” type conduits, from “P” and “C” conduits.

2.2 HANDHOLES

- A. Handholes and special marking covers shall be designed for AASHTO M309 H-20 traffic loading. Boxes shall include extensions for interior dimension shown on Contract Drawings and these Specifications. Handhole covers shall be checker plate, hot-dip galvanized after fabrication, inscribed, and provided with security “Penta” style bolts.
- B. Handhole covers shall have identification letters one-inch high and 3/4-inch wide minimum, indicating “ELECTRIC” or “SIGNAL”, as applicable, and handhole number, “HH-E-1” for example, as shown on Contract Drawings. For example the electrical handhole cover

will be inscribed "ELECTRICAL HH-E-1". Electric handholes are all handholes with AC voltage cables. Signal handholes are all handholes with DC voltage cables.

- C. Acceptable products include: Christy Concrete B1017, B1324 and B1730 with extensions, checker plate, hot dipped galvanized covers, and security bolts, or equal. Size as noted on Contract Drawings. Provide with identification lettering and inscribed handhole tag number on cover.

2.3 DUCTS AND SPACERS

- A. Underground conduits shall be Schedule 40 PVC for utility and PVC coated galvanized rigid conduits for everything else. Refer to Section 16110 – Electrical Raceway Systems for conduit specifications.
- B. Concrete cap shall be 2000 psi, red colored, minimum four-inch thick concrete.
- C. Install conduit spacers in ductbanks, where four or more conduits are provided. Conduit spacers shall be Carlon Snap-Loc Spacers, or equal, with minimum 1½" duct separation, and spacers installed at five foot on center intervals.

2.4 CONDUIT TAGS

- A. Provide permanent, stainless steel 2-inch diameter conduit tags with conduit number pressure stamped onto the tag for exposed conduits. Conduit numbers shall be 1/2-inch minimum. Tags relying on adhesives or taped-on markers are not acceptable.
- B. Conduit tags in underground installations like handholes, wetwell, and vault, shall be 2" diameter engraved black phenolic tags, with 1/2-inch white lettering.

2.5 WARNING TAPE

- A. Provide heavy-gauge, red, non-adhesive polyethylene tape of six-inch minimum width, four-mil nominal thickness, with black lettering, for use in trenches containing electric circuits. Use tape with the following printed warning: "CAUTION-ELECTRIC LINE BURIED BELOW".
- B. Acceptable products include: Harris Industries, Inc. Underground Tape Catalog No. UT-29, or equal.

2.6 GROUND ROD BOXES

- A. Refer to Section 16450 – Grounding for ground rod boxes.

PART 3 - EXECUTION

3.1 GENERAL

- A. Raceway systems shall be electrically and mechanically complete before conductors are installed. Bends and offsets shall be smooth and symmetrical, and shall be accomplished with tools designed for this purpose. Factory elbows shall be utilized wherever possible.
- B. Do not concrete encase underground raceways until they have been inspected by the Engineer. Do not backfill ductbanks until they have been inspected by the Engineer.

- C. Warning Tapes: Bury warning tapes approximately 12 inches above top-of-conduits, minimum of 6" below grade, in all underground conduit runs or duct banks. Align parallel to and within six inches of the centerline of runs that are 12 inches wide or less. Provide two tapes and align parallel to and within six inches of the centerline of each side of runs that are more than 12 inches wide.

3.2 TRENCHING

- A. Verify the location of all existing cables, conduits, piping, and other equipment in or near the areas to be trenched, prior to starting trenching. Call an Underground Service firm before trenching.
- B. Trenches shall not be left unattended unless the area is fenced or barricaded to restrict entry to the area. Repair any equipment damaged during trenching.

3.3 DUCTBANKS AND TRENCHING

- A. Separation and Support
 1. Separate runs of four or more raceways in a single trench with preformed, nonmetallic spacers designed for the purpose. Install conduit spacers at intervals of five feet.
 2. Support raceways installed in fill areas to prevent accidental bending until backfilling is complete. Tie raceways to supports, and raceways and supports to the ground, so that raceways will not be displaced when concrete encasement or sand or earth backfill is placed.
- B. Arrangement and Routing
 1. Make changes in the location or cross-section as necessary to avoid obstructions or conflicts. Where raceway runs cannot be installed substantially as shown on submitted and approved layout drawings because of conditions not discoverable prior to digging of trenches, refer the condition to the Engineer for instructions before further work is done. Determine exact alignment and depth as required to avoid other utilities.
 2. Where other utility piping systems are encountered or being installed along a raceway route, maintain a 12-inch minimum vertical separation between raceways and other systems at crossings. Do not place raceways over valves or couplings in other piping systems. Refer conflicts with these requirements to the Engineer for instructions before further work is done.
 3. Ductbank alignments shown on Drawings are diagrammatic. Actual alignments shall contain no sharp bends and shall be installed with minimum radius bends as required in the NEC or installed cable, whichever requires a larger radius bend.
- C. Concrete Cap
 1. Cap all underground conduits with 4-inches of concrete.
 2. Backfill material above concrete cap shall be imported material containing no particles larger than three inches in diameter and free from roots or debris, similar to 3/4" aggregate base, refer to Section 02200 - Excavation and Backfill. Compact backfill in maximum 12-

inch layers to at least 95 percent of the maximum density at optimum moisture content as determined by AASHTO T 180.

3.4 HANDHOLES

- A. Provide excavation, backfilling, compaction and grading, etc., in accordance with requirements specified in Contract Documents.
- B. Do not install handholes until final conduit grading, including field changes necessitated by underground interferences, has been determined. Set frames just above final grade so that the site drains away from the handholes.
- C. Make the installation so that raceways enter handholes at nearly right angles and as near as possible to one end of a wall, unless otherwise indicated.
- D. Provide for over-excavation of the handhole foundation area and furnish minimum of one-foot depth of ¾-inch drain rock below the handhole and six inches beyond all handhole sides.
- E. Bolt down covers with Penta bolts.

3.5 CONDUIT IDENTIFICATION

- A. Refer to Section 16110 – Electrical Raceway Systems for conduit tag specification.
- B. All conduits shall be identified with minimum of two tags, one at each end. In addition all conduits shall be tagged at intermediate pull points like cabinets, handholes or pull boxes, as applicable to conduit run. Use correct type of tag based on installed location. Tags shall be inscribed as designated on the approved Interconnect Diagrams.
- C. All underground conduits shall be tagged within cabinets, handholes and wetwell and vault and where stub up into equipment.
- D. Exposed and Above Grade Conduits: Attach stainless steel tags to conduits with 316 stainless steel tie wire at end of the conduit.
- E. Below Grade Conduits: black engraved phenolic conduit tags shall be applied with epoxy to the wall of the handhole or wetwell or vault above the conduit entrance, or attached to conduit with black nylon cable tie if conduit is accessible.
- F. Conduits shall be tagged prior to Field Testing.

3.6 PREPARATION FOR PULLING IN CONDUCTORS

- A. Ream all raceways, remove burrs, and clean raceway interiors. Immediately after installation, plug or cap all raceway ends with watertight and dust-tight seals.
- B. Pull a bristle brush and then a mandrel through each raceway to remove any debris and clean the raceway prior to pulling conductors. Mandrel diameter shall be approximately 1/4-inch less than the raceway inside diameter, through each raceway. For conduits of one inch and less, pull a rag through to clean and remove debris prior to pulling the conductors.
- C. For all raceways which contain less than 50 percent of the NEC-allowed fill, install a pull tape along with the conductors.

3.7 EMPTY RACEWAYS

- A. Certain raceways will have no conductors pulled in as part of this Contract. Identify them with conduit tags at each end and at any intermediate pull point of each such empty raceway. Provide a removal cap over each end of empty raceways. Provide a pull tape in each empty raceway.

3.8 TRENCH SETTLING

- A. If, at any time during a period of one year dating from the date of final acceptance of the project, there shall be any settlement of conduit trenches, the Engineer may notify the Contractor to immediately provide additional fill and to make such repairs or replacements in paving, planting, or structures, as may be deemed necessary at the Contractor's expense.

END OF SECTION

SECTION 16120
WIRES AND CABLES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Provide wires and cables, complete and operable, in accordance with the Contract Documents.

1.2 REFERENCE SPECIFICATION, CODES, AND STANDARDS

- A. Reference Codes: All work specified herein shall conform to or exceed the applicable requirements of the National Electrical Code (NEC); provided that, where a local code or ordinance is in conflict with the NEC, the provisions of said local code or ordinance shall take precedence. For additional requirements, see Section 16050 – Electrical Work, General.
- B. Commercial Standards
 - 1. ANSI/IEEE C2 National Electrical Safety Code.
 - 2. ANSI/NFPA 70 National Electrical Code, 2014.
 - 3. ICEA S-95-658 Insulated Cable Engineers Association
 - 4. NEMA WC70 National Electrical Manufacturers Association

1.3 CONTRACTOR SUBMITTALS

- A. General: Submit Shop Drawings in accordance with Section 16050 – Electrical Work, General.
- B. Shop Drawings
 - 1. Product Data: Provide complete catalog cuts of all cables, wires, terminations, splices, fittings, identification systems, and tape. This applies to vendor-supplied cables including sewage lift pumps, float switches, and level transducer.
 - 2. Test Reports: Indicate results of the cable megger tests for all 600 VAC rated cables.
- C. Tags and Inscriptions: Contractor to submit individual wire tags. Submit tag materials and inscription schedules for approval.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products to site under provisions of Section 16050 – Electrical Work, General.
- B. Accept cable and accessories on site in manufacturer’s packaging. Inspect for damage.
- C. Store and protect in accordance with manufacturer’s instructions.
- D. Protect from weather. Provide adequate ventilation to prevent condensation.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All conductors, including grounding electrode conductors, shall be stranded copper. Aluminum conductor wire and cable will not be permitted. Insulation shall bear the UL label and the manufacturer's trademark, and shall identify the type, voltage, and conductor size. All conductors (except flexible cords and cables, fixture wires, and conductors that form an integral part of equipment such as motors and controllers) shall conform to the requirements of Article 310 of the National Electric Code, latest edition, for current carrying capacity. Flexible cords and cables shall conform to Article 400, and fixture wires shall conform to Article 402. The use of the manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.

2.2 LOW VOLTAGE WIRE AND CABLE

- A. Power and Lighting Wire:
 - 1. All power and lighting circuits wire shall be rated 600 volts, Class B stranded copper, UL-listed, with XHHW-2 insulation rated for 90°C in wet or dry locations.
 - 2. All insulated equipment grounding conductors shall be rated 600 volts, Class B stranded copper, UL-listed, with XHHW-2 insulation rated for 90°C in wet or dry locations, and colored green.
 - 3. Acceptable products include: Okonite X-Olene XHHW-2, or equal.
- B. Single Conductor Control Wire:
 - 1. Single conductor control wires shall be rated 600 volts, Class B stranded copper, UL-listed, with XHHW-2 insulation rated for 90°C in wet or dry locations.
 - 2. Acceptable products include: Okonite X-Olene XHHW-2, or equal.

2.3 DIRECT BURIED GROUNDING ELECTRODE CONDUCTORS

- A. Provide bare, concentric stranded, copper conductors conforming to ASTM B-8, size as indicated on the drawings, or minimum size as specified in Section 16450 – Grounding, for the ground system at ground rods, grounding electrode conductor, transformer bonding, panel grounding, and where indicated.
- B. Acceptable Products: Southwire Bare Copper Wire, or equal.

2.4 600V CABLE TERMINATIONS

- A. Compression connectors shall be Burndy "Hi Lug", Thomas & Betts "Sta-Kon", or equal. Threaded connectors shall be split bolt type of high strength copper alloy.
- B. Pressure type, twist-on connectors are only acceptable for light and receptacle circuits.
- C. General purpose insulating tape shall be Scotch No. 33, Plymouth "Slip-knot", or equal. High temperature tape shall be polyvinyl as manufactured by Plymouth, 3M, or equal.

2.5 CONDUCTOR AND CABLE TAGS

- A. Tags relying on adhesives or taped-on markers are not acceptable.
- B. Conductor labels for individual wires, installed at each termination point shall be white heat-shrink with thermal transfer printing, 3-to-1 shrink ratio, two inches long, and meet UL 224. Inscription shall be per approved Interconnect Diagrams, based on origin/destination format. Acceptable products include: Raychem Tyco Shrink Mark Heat Shrinkable Sleeves, or equal.

2.6 TELEPHONE CABLE

- A. Telephone cable shall be indoor rated, 4 pair, 24 AWG, solid copper with PVC insulation and PVC overall jacket.
- B. Acceptable Products: Belden 8757, or approved equal.

2.7 ANTENNA CABLE

- A. Antenna cables shall be 1/2" coaxial. Provide all antenna cable connectors and weatherproof connection kit, and miscellaneous hardware for complete and operable radio system, including antenna mounts.
- B. Acceptable Products: Antenna cable by Andrew 1/2-inch Heliac Model LDF4-50A, or approved equal. Connectors and weatherproof splice kit by Andrew, or approved equal.

2.8 ELECTRICAL TAPE FOR COLOR CODING

- A. Electrical tape shall be premium grade, not less than seven mils thick, rated for 90°C minimum, flame-retardant, weather resistant, and available in suitable colors for color coding. The tape shall be resistant to abrasion, ultraviolet rays, moisture, alkalies, solvents, acids, and suitable for indoor and weather-protected outdoor use. The tape shall be suitable for use with PVC and polyethylene jacketed cables, and meet or exceed the requirements of UL 510.
- B. Acceptable products include: 3M 35 Scotch Vinyl Electrical Tape for Color Coding, Plymouth Rubber Company Premium 37 Color Coding Tape, or equal.

PART 3 - EXECUTION

3.1 GENERAL

- A. Provide and terminate all power, control, and instrumentation conductors, except where indicated.

3.2 INSTALLATION

- A. No conductors shall be installed until conduits have been cleaned and labeled, and Interconnect Diagrams have been submitted and approved.
- B. If mechanical means are used to pull cable, the pulling tension shall be monitored, recorded and submitted to the Engineer.
- C. Tighten terminal bolts using torque type wrenches and/or drivers to tighten to the inch-pound requirements of the NEC and UL.

- D. Instrumentation wire shall not be run in the same raceway with power and control wiring except where specifically indicated.
- E. Wire in panels, cabinets, and wireways shall be neatly grouped using nylon tie straps, and shall be fanned out to terminals.
- F. Install bare grounding electrode conductor 36 inches below finished grade as shown on the Drawings. Reference Specification Section 16450 – Grounding for further requirements.

3.3 SPLICES AND TERMINATIONS

- A. General:
 - 1. There shall be no cable splices without the approval of the Engineer, except for pump power circuits, or as noted on Drawings.
 - 2. Stranded conductors shall be terminated directly on equipment box lugs making sure that all conductor strands are confined within the lug. Use forked-tongue lugs where equipment box lugs have not been provided.
 - 3. Excess control and instrumentation wire shall be properly taped and terminated as spares.
- B. Control Wire and Cable:
 - 1. Control conductors shall be terminated only at the locations indicated and only on terminal strips or terminal lugs of vendor furnished equipment.
 - 2. All control wire and spare wire shall be terminated to terminal strips in junction boxes, enclosures and panels.
- C. Shielded instrumentation cables shall be grounded at one end only, preferably the Control Panel.
- D. Antenna cable connections made to antenna, shall be made with weatherproofing kits supplied by antenna cable manufacturer.

3.4 CABLE IDENTIFICATION

- A. All cables and conductors shall be identified. All conductors shall have wire labels at each termination point. Labels shall be permanent, waterproof, legible, and heat shrink applied.
- B. Cable labels and conductor labels shall match Interconnect Diagrams.
- C. Cables and conductors shall be labeled prior to beginning Pre Demonstration period.

3.5 GROUPING OF WIRES AND CABLES

- A. All wires and cables shall be neatly grouped in pull boxes, Termination Cabinet, and handholes. Wires and cables shall be grouped so that the wires of the individual circuits are together and tagged with the cable number.
- B. Cables passing through handholes shall be looped at least once along every wall. Loops shall be organized, trained, and neatly installed.
- C. Single conductors and cables in handholes and other indicated locations shall be bundled with nylon cable ties placed at intervals not exceeding 18 inches on centers.

3.6 FIELD TESTING

A. Cable Testing:

1. Cables – all cables #10 AWG and larger shall be tested by Contractor after pulling and prior to termination:
 - a. Power Conductor Test – After installation provide megger testing at 1000 VDC for conductor to conductor, and conductor to ground.
 - b. Provide cable testing per the latest NETA standards.
2. All field testing shall be done after cables are installed in the raceways, labeled and tagged, and prior to energizing. Disconnect equipment that might be damaged by this test.
3. Cable field testing shall be witnessed and signed off by the City and/or Engineer. Cable field testing results shall be submitted to the Engineer for review and acceptance.
4. Acceptable cable field testing shall be 100 mega-ohms or greater. If results are less than acceptable level, replace cable.

END OF SECTION

SECTION 16140
WIRING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Provide Termination Cabinet, wiring devices, complete and operable, in accordance with the Contract Documents.
- B. Single Manufacturer: Like products shall be the end product of one manufacturer in order to achieve standardization of appearance, operation, maintenance, spare parts, and manufacturer's services.
- C. Refer to Drawings for manufacturers of SCADA Workstation desk and power strip.

1.2 CONTRACTOR SUBMITTALS

- A. General: Contract submittals shall be in accordance with Section 16050 – Electrical Work, General.
- B. Shop Drawings
 - 1. Complete catalog cuts of switches, receptacles, enclosures, covers, and appurtenances, marked to clearly identify proposed materials.
 - 2. Documentation showing that proposed materials comply with the requirements of NEC and UL.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All devices shall carry the UL label.

2.2 LIGHTING SWITCHES

- A. Light switches shall be heavy duty, industrial, toggle type, 20-amp, 125 VAC-rated, self-grounding, and back and side wired. Light switch handles shall be brown. Contact arm spring and terminal plate shall be copper alloy. Contact points shall be silver cadmium oxide. Ground terminal shall be nickel-plated steel with brass screw.
- B. Switches shall conform to UL 20.
- C. Acceptable products: Hubbell 1221B, or equal.

2.3 STORM DRAIN SITE FLOOD LIGHT SWITCH AND LOCK BOX

- A. Light switch to operate the storm drain flood light shall be spring wound timer, 0-4 hours, metal plate, SPST, 20 amp, 125 VAC, mounted on pole. Spring wound timer switch shall be Intermatic FF4H, or approved equal.

- B. Provide lockable while in use cover for timer switch. Lockable cover to be die-cast aluminum weatherproof hinged cover, 2” minimum depth, with means of attaching locking device. Lock box to be Hubbell WP26E, or approved equal.

2.4 GENERAL PURPOSE RECEPTACLES

- A. Duplex receptacles shall be 125 VAC, 20 amperes, polarized three-wire type, NEMA 5-20R conforming to UL 498. Receptacles shall be brown. Receptacles shall conform to UL 498. External wiring shall be provided by side mounted terminal screws. Acceptable products: Hubbell 5362, or equal.
- B. Ground-fault circuit interrupting receptacles (GFCIs) shall be installed at outdoor locations. GFCIs shall be rated 125 V, 20 amperes NEMA 5-20R, conforming to UL 498 and UL 943, and brown. Acceptable products: Hubbell GF-5362, or equal.

2.5 OUTLET AND DEVICE BOXES

- A. Outlet and Device boxes are specified in Section 16110.

2.6 OUTDOOR DEVICE COVERS

- A. Outdoor receptacle covers shall be metal while in use cover, weatherproof, and shall be die cast aluminum lift covers for GFCI receptacles stainless steel screws, and neoprene gasket. Covers shall be Eaton WIUMV-1, or equal.

2.7 TERMINATION CABINET

- A. Termination Cabinet shall be NEMA 4X, 316 stainless steel, dual compartments each with hinged three point latching doors, with intrinsically safe intermediate barrier with flange style sealing plates and cable seals, freestanding and suitable to mount on concrete pedestal. One compartment shall be hazardous rated Class 1, Div 2 for pulling in wetwell pump and instrument manufacturer cables, but will include conduit seal compression fittings on all incoming conduits from wetwell (Class 1, Div 1). Conduit seals compression fittings shall be Rotex compression fitting suitable for creating a mechanical barrier for cables to pass from a Class 1, Div 1 area to a Class 1, Div 2 hazardous area, or approved equal. One compartment shall be non-hazardous rated. Manufacturer cables shall pass thru barrier via cable seals, and to terminal blocks within non-hazardous compartment. Provide Termination Cabinet with padlockable door on each compartment. Refer to Contract Drawing Details for further Termination Cabinet requirements.
- B. Provide a NEMA 12 enclosure within non-hazardous compartment for intrinsically safe terminal blocks and wiring. Enclosure to include back panel, terminal blocks, and labels.
- C. Provide finger safe terminal blocks for pump cables, float level switches, level transducer cables (for future use), and all equipment grounding conductor. Terminal blocks to be labeled with machine imprinted labels. Pump terminal blocks to be din rail mounted and rated 30 amps, sized for manufacture pump power cables. Instrumentation terminal blocks to be din rail mounted and rated 20 amps. Provide equipment grounding bus with #2/0 AWG lug. Provide engraved phenolic nameplates above terminal blocks including:

- A. Ground all devices, including switches and receptacles, in accordance with NEC and Section 16450 – Grounding.
- B. Ground switches and associated metal plates through switch mounting yoke, outlet box, and raceway system.
- C. Ground flush receptacles and their metal plates through positive ground connections to the outlet box and grounding system. Maintain ground to each receptacle by spring-loaded grounding contact to mounting screw or by grounding jumper, each making positive connection to the outlet box and grounding system at all times.

3.5 FIELD TESTING

- A. Provide checkout, field, and functional testing of wiring devices in accordance with Section 16950 – Electrical Testing.
- B. Test each receptacle for polarity and ground integrity with a standard receptacle tester.
- C. Wiring Devices testing shall be completed during field testing period, prior to start of 7 day “live test”.

END OF SECTION

SECTION 16233
STANDBY GENERATOR

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Packaged diesel engine generator system to include the following components:

1. Diesel engine.
2. Generator, with batteries and battery charger.
3. Liquid coolant system.
4. Fuel system and skid-mounted fuel storage tank.
5. Exhaust system.
6. Control system.
7. Skid system.
8. Circuit breaker, bonded neutral connected to grounding electrode conductor.
9. Automatic resistive loadbank rated for 50% of generator kw, mounted within weatherproof enclosure, on radiator.
10. Residential critical sound attenuating, weatherproof, enclosure. Enclosure to be painted white, or tan, or approved equal. Provide with series connected intrusion switches on all doors. Doors to be pad lockable.
11. Accessories as specified.
12. Coordination with ATS supplier, and configuration of ATS for proper Standby Generator operation.
13. All other equipment as required to provide a complete and operable power generation system.

B. Related Sections:

1. Section 16050 – Electrical Work, General.
2. Section 16425 – Automatic Transfer Switch
3. Section 17200 – Pump Control Panel

1.02 REFERENCES

A. Referenced Standards: Construct equipment in accordance with the applicable requirements of the following codes and standards:

1. National Electrical Code (NEC).
2. American National Standards Institute (ANSI).
3. National Electrical Manufacturers Association (NEMA).
4. Institute of Electrical and Electronic Engineers (IEEE).
5. Insulated Cable Engineers Association (ICEA).
6. American Society for Testing and Materials (ASTM).
7. Underwriters' Laboratories, Inc. (UL).
8. Electrical Generation Systems Association (EGSA).
9. Local Air Quality Management District.
10. Codes and standards referenced shall be considered minimum acceptable work.

1.03 SYSTEM DESCRIPTION

- A. The Contractor shall furnish all labor, materials, tools, equipment and services for supply, installation and wiring of the Standby Generator for installation. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
- B. Contractor shall provide and install outdoor rated Standby Generator, with weather proof enclosure, critical sound attenuation, Level 2, and sub base fuel tank, automatic resistive loadbank, complete and operable, in accordance with the Contract Documents. Contractor to provide all programming configuration of Standby Generator controls. Contractor to provide all programming configuration of ATS. Standby Generator shall be UL 2200 labeled.
- C. Contractor shall carefully coordinate the new standby generator enclosure location (per the proposed standby generator supplier's submittal information) with field conditions to ensure that adequate clearances may be obtained. This coordination shall be performed by the Contractor prior to submitting submittal information for Engineer's review. Provide required clearances around Standby Generator and orient for ease of fueling and maintenance.
- D. Provide and submit Interconnect Drawings between Standby Generator, ATS, and Pump Control Panel. Number of wires shall be as required, or per Contract Drawings, whichever is greater.
- E. Standby Generator Requirements:
 - 1. Power Output Rating: Kilowatts and voltage as scheduled below, delivered at 0.8 power factor, 480 VAC, three phase, 3 wires, 60 hertz, without exceeding NEMA MG-1 temperature rise limits. Bond neutral at generator, directly to grounding electrode conductor. Generator shall be rated for Emergency Standby service.
 - 2. Provide with base mounted fuel tank sized for 24 hours at 100% rated load. Fuel tank shall be double walled, and meeting State seismic standards.
 - 3. Generator housing shall reduce noise to 74 dB or less at 23 feet from Generator.
 - 4. Generator will meet local air district air quality permitting requirements.
 - 5. Loadbank: Automatic load leveling and load regulation to maintain total generator load (50% minimum) within a preset bandwidth. Loadbank controller senses generator load and automatically adds/subtracts load bank steps in order to maintain total generator load at a desired level. Controller senses amperes. Adjustable level and delay. Control panel with control power on/off switch, manual/off/automatic load step switches, master load control switch, over-temp indicator and normal operation indicator.

1.04 SUBMITTALS

- A. Shop Drawings:
 - 1. Complete Package: Submit complete shop drawings of each component making up the Standby Generator package.
 - 2. Submit exhaust system silencer noise attenuation curves.
 - 3. Submit Standby Generator sizing calculations.
 - 4. Submit Bill of Materials summarizing all manufacturers, part numbers and applicable ratings or sizes of all equipment or components provided.
 - 5. Engine, including:
 - a. Make, model, displacement, cylinder arrangement, and aspiration.

- b. RPM and HP at rated kW output.
 - c. Manufacturer's certified engine emissions test data at full, 3/4, 1/2 and 1/4 loads including data for NOx, HC, CO, SO2, Particulates and/or PM10 demonstrating compliance with current emissions standards.
 - d. Provide fuel consumption in gallons per hour at full, 3/4, 1/2 and 1/4 loads.
 - e. Cold cranking amperage required by starting system or manufacturer's recommended battery capacity in cold cranking amps at 32°F.
6. Engine Systems and Accessories:
- a. Cooling system, including radiator and low coolant alarm device.
 - b. Airflow specifications for radiator and cooling system, including the required airflow and maximum allowed inlet and discharge airflow restriction across the radiator.
 - c. Jacket water heater(s) and heater isolation valves.
 - d. Isochronous governor.
 - e. Starting system, including voltage, quantity and size of battery, battery box for installation and line voltage battery charger with cut sheets showing alarm contacts and fault indications.
 - f. Engine driven automatic battery charging alternator with solid-state voltage regulation (in addition to line voltage battery charger).
 - g. Fuel system specifications, including maximum fuel consumption, total fuel flow rate (including bypass fuel flow), cut sheets showing pump, and water separator/filtration system listing fuel flow capacity.
7. Engine-generator control system, including control system, switches, panel, gauges or digital display features, dry contact accessory kit for communication of specified status and alarm conditions to Control Panel, engine alarms and protective devices.
8. Weatherproof enclosure, with critical residential sound attenuation ratings. Submit exterior paint samples. Color shall be desert tan or similar.
9. Generator and Electrical System:
- a. Submit system schematic diagram showing all piping and wiring interconnections with sizes and quantities. Submit ladder-type schematic electrical diagrams with legend identifying all devices on diagrams
 - b. Generator construction, windings and pitch, insulation class and treatment, temperature rise.
 - c. Voltage dip curves for motor starting.
 - d. Regulator.
 - e. PMG excitation.
 - f. Generator circuit breaker and breaker enclosure and bussing. Provide mounting location of breaker enclosure (to verify code required clearances).
10. Structural steel side-rail skid base for engine-generator set with anchor bolt locations and dimensioned layout. Submit catalog data and installation instructions and calculations for size and number of anchor bolts. Structural Standby Generator anchoring calculations to be signed and stamped by a licensed Civil or Structural Professional Engineer.
11. Automatic Loadbank.
12. Submit Interconnection Diagrams that show field terminal block numbers and wiring requirements to and from the automatic transfer switch, panelboard and Control Panel.
13. Emission Data: The engine generator supplier shall furnish to the engineer all emissions data, and any other data required by the BAAQMD for the application to permit construction and operation of the proposed equipment, as required. This shall include documentation for BAAQMD BACT (Best Available Control Technology). This includes all permits, as required.

14. Submit listing of spare parts including listing of all Generator Maintenance Service Kit parts.
 15. Detailed description of factory testing program, testing equipment, reporting procedure, and criteria for test passing or failing.
 16. Start-up Inspection Report: Submit a start-up inspection report signed by the engine manufacturers authorized field service representative.
 17. Field testing procedures.
 18. Training agenda with topics to be covered. Topics to include, at a minimum: Maintenance items and procedures, Alarms, Configuration settings, Review of O&M Manual, Showing of Spare Parts. Resume of trainer.
- B. Manufacturer's Installation Instructions: Submit a detailed recommended installation procedure for the engine/generator equipment.
- C. Test Reports:
1. Submit certified copies of the results of the factory tests.
- D. Certificates and Final Documentation:
1. For the Complete Package: Upon completion of installation, manufacturer shall issue a certification of compliance with the Contract Documents.
 2. Submit "as built" system Interconnection Diagrams in both hardcopy and electronic format (i.e. ACAD files).
 3. Submit configuration files of Standby Generator controller.
- E. Operation and Maintenance Data: Instruction manuals containing operation and maintenance procedures. The O&M Manuals must be for the specific or actual piece of equipment or system furnished under this Contract.
1. Provide a separately tabbed section in the O&M Manual marked "Replacement Parts", with a bill of materials listing of all common field replaced spare parts and including the part numbers for replacement filters, belts, lamps hoses, thermostat, and fuses.
 2. Provide troubleshooting and repair service manuals. These manuals cover work beyond the scope of ordinary O&M manuals and include troubleshooting and diagnosis procedures.
 3. All information, procedures, or parts which are relevant and applicable to the equipment and system actually furnished under this Contract shall be highlighted or designated with an arrow pointed to the applicable portions.
- F. Quality Control Submittals:
1. Manufacturer's certificate of proper installation.
 2. Factory test report.
 3. Field test report and certification.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
1. The engine, generator and all major items of auxiliary equipment shall be manufactured by manufacturers currently engaged in the production of such equipment.
 2. Factory authorized parts and service facility located within 100 miles of the Project site.
 3. Materials, equipment, and parts comprising the units specified shall be new and unused, of current manufacture, and of the highest grade.
 4. System to have engine and generator unit factory-assembled and tested by the engine

manufacturer and shipped to the jobsite by an authorized dealer.

B. Supplier Qualifications:

1. Standby Generator to be furnished by one factory authorized supplier who shall be responsible for furnishing, testing, installation supervision, and guaranteeing the system.
2. The factory authorized supplier for the Standby Generator will be referred to as the Primary Supplier. The responsibility of the Primary Supplier shall extend to the selection and furnishing of the specified components and supervision of installation, testing and start-up.

C. Supplier Services: Provide Standby Generator manufacturers' services at the job site for the minimum man-days listed below, travel time excluded

1. One man-day for support services, which include a pre-startup inspection report, adjustment of the equipment, and start-up and field-testing supervision. Field testing shall include field transfer sequence tests and field load-bank tests.
2. One man-day to instruct the City's personnel in the operation and maintenance of the equipment (on-site). Training shall not take place on same day as start up. Submit final copies of previously reviewed O&M manuals at least ten (10) working days prior to this instruction.

D. Regulatory Requirements: Comply with the following:

1. Regulations of the Fire Prevention Bureau of the fire department having jurisdiction.
2. State of California:
 - a. Requirements of Cal-OSHA.
 - b. Requirements of local Air Quality Management District or Air Pollution Control District.
3. International Building Code.
4. Uniform Fire Code.
5. Other applicable state and local codes.
6. Contractor shall not be relieved from complying with the specifications that may be in excess of, and not contrary to, the regulations.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Project Site Elevation: 15 feet above sea level.
- B. Project Site Maximum Ambient Temperature: 40 degrees Celsius.

1.07 WARRANTY

- A. Generator Package: Covered by a manufacturer's standard warranty for a minimum of 2 year from date of acceptance or first beneficial use of the package.

1.08 MAINTENANCE

- A. Spare Parts and Accessories: Furnish the following for the engine/generator to the City prior to acceptance of the Work and included in rubber tub:
 1. General Maintenance Service Kit.
 2. In addition to the Generator Maintenance Service Kit above, provide the following: 2 air filters, 2 fuel filters, 2 oil filters, 2 light bulbs, 1 radiator cap, 1 thermostat and gasket, 1 set of belts.

- B. Special Tools: Furnish a set of specialty tools necessary for routine maintenance of the equipment.

PART 2 PRODUCTS

2.01 DIESEL ENGINE

- A. Manufacturers:
 - 1. Engine: One of the following, no equal:
 - a. Caterpillar.
 - b. Cummins.
 - c. Kohler.
- B. Engine Requirements:
 - 1. Engine Type: 4-Stroke Cycle, turbocharged. Provide in-line diesel engine with compression ignition, meeting all requirements of NFPA 37 and NFPA 110.
 - 2. Maximum Rotational Speed: 1,800 rpm.
 - 3. Minimum Piston Displacement: As scheduled.
 - 4. Main Bearings: Minimum of five, replaceable insert type.
 - 5. Cooling: Liquid cooled with engine driven coolant pump.
 - 6. Fuel Type: Meet specifications when operating on Number 2 diesel fuel oils meeting the requirements of the Air Quality Management District or Air Pollution Control Board; engines requiring premium fuels shall not be considered.
 - 7. Emissions: Meet the requirements of the Air Quality Management District or Air Pollution Control Board, as applicable to the Project site, as size of Standby Generator.
 - 8. Air filters: Replaceable dry element type with dirty condition differential pressure indicator.
 - 9. Lube oil filters: Cartridge type.
- C. Governor: Electronic, isochronous digital type to regulate engine speed within ± 0.33 percent at any constant load from no load to full load.

2.02 GENERATOR

- A. Manufacturers:
 - 1. Generator: One of the following, no equal:
 - a. Caterpillar.
 - b. Cummins.
 - c. Kohler.
 - 2. Voltage Regulator: Standard included with manufacturer's engine/generator unit, solid-state volts/Hz.
- B. Generator:
 - 1. Type: Synchronous, 4-pole, rotating field.
 - 2. Exciter Type: Brushless, permanent magnet.
 - 3. Leads: Quantity of twelve (12), re-connectable.
 - 4. Insulation: Class H, 130 degrees Celsius temperature rise per NEMA MG1.
 - 5. Bearing: Sealed type.
 - 6. Coupling: Flexible disc.
 - 7. Amortisseur Windings: Full.

8. Voltage Regulation: +0.5% average, no-load to full-load.
9. One-Step Load Acceptance: 100% of rating per NFPA 110.
10. Unbalanced Load Capability: 100% of rated standby current.
11. NEMA MG1, IEEE and ANSI Standards compliance for temperature rise and motor starting.
12. Capable of sustained short circuit current up to 300% of rated current for 2 seconds.
13. Self-ventilated, drip-proof construction.
14. Vacuum impregnated windings with fungus-resistant epoxy varnish.

2.03 COOLING SYSTEM

- A. Liquid-cooled, rated for continuous operation with a maximum ambient temperature of 50 degrees Celsius.
- B. Engine-driven fan.
- C. Radiator: Mounted on the engine skid.
- D. Coolant Solution: Provide solution of 50 percent ethylene glycol and softened water; add chemical water conditioner as recommended by the engine manufacturer.
- E. Jacket Water Heater: Sized to maintain engine jacket water to 90 degrees Fahrenheit for an ambient temperature of 0 degrees Celsius. Voltage per Drawings.
- F. Radiator Hoses: Provide premium, oil resistant hoses of Viton or silicone rubber carcass with reinforcing fabric; assembly to be suitable for a minimum service temperature of 250 degrees Fahrenheit.

2.04 FUEL SYSTEM

- A. General: Provide fuel system, accessories and scheduled fuel tanks meeting the following requirements. Fill fuel tank after field testing completed. Fuel tank to meet State seismic requirements.
- B. Subbase Fuel Tank: Provide a skid-mounted, subbase fuel tank with minimum volume as scheduled and meeting the following:
 1. Provide UL listed tank with secondary containment rupture basin.
 2. Construction: Reinforced steel channel system with minimum thickness of 7 gauge for channels and 12 gauge for tank construction.
 3. Provide the following connections:
 - a. Fill pipe extension to within 6 inches of bottom of fuel tank.
 - b. Five (5) gallon spill containment with 95% shutoff.
 4. Provide rupture basin level switch and alarm.
 5. Provide exterior epoxy coating with urethane top coat.
- C. Fuel Filters: Size filters for 10 percent above the engine fuel pump capacity.
 1. Provide water/fuel separator.
 2. Provide primary fuel filter.
 3. Provide secondary fuel filter.
- D. Engine Fuel Pump: Provide engine-driven fuel pump.

- E. Fuel Piping: All fuel piping shall be black iron or flexible fuel hose rated for this service. No galvanized piping will be permitted. Flexible fuel lines shall be minimally rated for 300 degrees F and 100 psi.

2.05 EXHAUST SYSTEM

- A. Critical type 316L stainless steel silencer enclosed within acoustical enclosure, dry type exhaust system.
- B. Exhaust Flow at Rated kW: 167 cubic feet per minute.
- C. Exhaust Temperature at Rated kW: 1085 degrees Fahrenheit.
- D. Maximum Allowable Backpressure: 1.8 inches of mercury.

2.06 LOADBANK

- A. Resistive loadbank, bolted to radiator, integral to Standby Generator housing, designed for permanent installation. Loadbank shall be UL listed with the following features:
 - 1. Capacity: 50% of Generator KW
 - 2. Voltage: 480V AC, 3- phase, 3- wire
 - 3. Frequency: 60 Hertz
 - 4. Load Steps: 10 KW step resolution
 - 5. Duty Cycle: Continuous
 - 6. Temp. Rating: 180°F max. air intake temp. 60°-100°F nominal air temp. rise
 - 7. Airflow Required: Radiator air outflow
 - 8. Altitude: less than 1000'
 - 9. Control Power: Internal, from generator. 480V AC, single-phase. Fused circuits. Controls operate at 120V via control power transformer circuit.
- B. Principal system and components:
 - 1. Load Elements: Tubular type, weatherproof, totally enclosed, UL listed
 - 2. Load Control: Branch circuit magnetic contactors
 - 3. Element Short Circuit Protection: Branch circuit fuses. Fuses are 200KAIC, 600V, current limiting. Provide three spare fuses.
 - 4. Power Wiring: 150°C, insulated, color coded
 - 5. Power Connection: Barrier type power distribution block with line side compression terminals
 - 6. Control Wiring: 16AWG, 105°C
 - 7. Overheat Protection: Sensor to detect high exhaust air temp above 300°F. Circuits to disconnect load bank on over-temp. Alarm contacts.
- C. Enclosure: NEMA 1, installed within weatherproof housing. Galvanized steel construction. Mounted directly to engine radiator.

2.07 WEATHERPROOF ACOUSTICAL HOUSING

- A. Type: Provide aluminum enclosure to protect engine, generator, starting system, batteries, loadbank, and other specified accessories from weather exposure. Enclosure to be painted desert tan, or equivalent color as selected by City during submittal review process.

- B. Certified to withstand a 150 mph wind load.
 - 1. Lockable, flush-mounted door latches on removable doors with a viewing window in control panel door. The viewing window shall be positioned approximately to view the control panel inside.
- C. Vertical air inlet and outlet hoods with 90 degree angles to redirect air and reduce noise.
- D. Critical sound attenuated, residential rated, with minimum 2 inches of acoustical insulation. 14 gauge steel enclosure with powder-baked paint finish. Fasteners shall be stainless steel.
- E. Noise Reduction: Maximum dBA as scheduled.
- F. The housing dimensions shall not exceed 197-inches long, 53-inches wide and 99-inches high (inclusive of the fuel tank).

2.08 ENGINE - GENERATOR ELECTRICAL AND CONTROL SYSTEM

- A. Caterpillar EMCP 4.2 controller, or equivalent system by Kohler or Cummins. Equivalent control system shall provide, at minimum, all status, alarm and control features as the specified Caterpillar controller.
- B. Integral Controls for the Standby Generator shall have terminal blocks for termination of incoming remote start/stop control wires and alarm wires. The panel shall be equipped with controls and alarms as follows: Three-way position switch AUTO OFF HAND; Dry contact output for: Run Status (two dry contact outputs), Generator Fail (two dry contact outputs, configurable relay for common alarm type), Low Fuel, Battery Charger Fail, Low Battery, Tank Leak, Not in Auto, and Intrusion. Provide indication for: High coolant temperature, Low oil pressure, Battery charger fault / low battery voltage, Low coolant level, Overvoltage and Over speed. When in AUTO generator to start based on remote contact closure from ATS. Generator will continue to run until same contact opens, then the engine shall be idled and shutdown at the end of the cool off period. Control Panel shall operate from 120 volt, single phase, 60 Hz power, off battery charger circuit provided. Provide Control Panel with LCD display, or LED lamps as applicable, that reads: voltages, current, frequency, kVA, engine speed, low fuel level, low oil pressure, battery voltage, run hours, sensor failure, fault history, oil pressure, coolant temperature, time and date, low oil pressure shutdown, high coolant temperature shutdown, overvoltage, over speed, low coolant level, not in auto position alarm, and exercise speed. Provide with built in programmable exerciser. Provide with bar graph display, and 8 configurable relay outputs. Provide with Modbus protocol.
- C. Control system shall also be equipped with status and alarm dry contacts as indicated on the Drawings. Generator Fail alarm to Pump Control Panel shall be general or common alarm.
- D. Control system shall accept a remote dry contact Start/Stop command from the remote ATS as indicated on the Drawings.
- E. Standby Generator shall be provided with remote signal wiring terminal blocks for connection of all field signal wiring from the Pump Control Panel and ATS.
- F. Standby Generator shall have field wiring terminal blocks for two 20 ampere power connections for supplying the skid-mounted jacket water heater (240 VAC) and battery charger (120 VAC).

- G. Circuit Breaker: Provide a skid-mounted 100% rated main line molded case circuit breaker with minimum 22 kilo-amperes interrupting rating. Ampere rating shall be 250 amps, three poles.
- H. Generator shall be 480 VAC, three phase, three wire, with grounded electrode connection bonded to the neutral of the generator. Also bond neutral to ground bus at the generator.

2.09 GENERATOR SYSTEM OPERATION

- A. Provide control devices and logic to sequentially start, operate, control, test, and stop the generator system. Coordinate control system design so that on loss of utility power, power is automatically supplied by the generator and on return of stable utility power, power is automatically switched back to utility power and the engine shuts down.
- B. Engine Start Sequence:
 - 1. Engine shall not start if any of the safety shutdown circuits have been tripped and not cleared and reset.
 - 2. Automatic Engine Start Sequence:
 - a. Initiated by a dry contact closure from the remote automatic transfer switch.
 - b. Starter: Automatically crank the engine for adjustable times.
 - c. Automatic loadbank shall maintain minimum 50% load on generator during running operation.
- C. Emergency Shutdown Sequence: Engine shall shutdown immediately if the emergency stop button is activated, or any of the specified shutdowns activate.
- D. Normal Shutdown Sequence: Local or remote Stop signal shall cause the engine to run unloaded for an adjustable cool-down period and then stop.
 - 1. Remote stop signal shall be based on sensing the return of utility power for an adjustable 0 to 15 minute time period before the engine is stopped and return to utility power is limited. If utility power is lost during the time delay period the timer shall be reset to zero and the engine shutdown not initiated until the set delay time expires without an interruption of utility power.

2.10 SKID

- A. Skid Requirements: Mount the engine, generator, radiator, loadbank, and specified accessories on a common heavy-duty fabricated steel skid.
- B. Skid Construction: Fabricated steel skid to consist of a rigid welded frame of wide flange members or rails on each side.
- C. Anchors: The structural steel base shall be secured to the concrete pad with anchor bolts. Anchor bolts and nuts shall be 316 stainless steel. Provide and submit anchoring requirements (diameter, minimum embedment). Additional Requirements:
 - 1. Provide for bolting skid to the concrete slab according to manufacturer's anchor bolt layout.
 - 2. Installation shall have a crankcase drain pipe at least 8 inches from the floor, equipped with a readily accessible shutoff valve.
 - 3. Provide front and rear engine mounts from the skid in addition to a generator support mount.
 - 4. Provide bracing from the engine skid diagonally to the top of the radiator housing in addition to lower radiator supports on the skid.

2.11 ACCESSORIES

- A. Starting System: Provide 12 volt direct current electric motor starting system.
- B. Battery Charging Alternator: Negative ground, rated 40 amperes minimum.
- C. Battery: Rated minimum 650 cold cranking amperes.
- D. Battery Charger: 10 ampere UL approved, current limiting type which shall automatically recharge the battery. Battery charger shall be factory wired to the engine/generator control panel and shall receive power supply from the single 120 VAC external power supply.
- E. Provide plastic laminate red signs, 6” by 6” nominal, suitable for outdoor use with white letters measuring a minimum of one inch high. The signs shall read: “WARNING – THIS MACHINE MAY START WITHOUT WARNING BY REMOTE SIGNAL. DO NOT WORK ON MACHINE UNLESS MASTER SELECTOR SWITCH IS OFF”. Mount signs on each side of the Standby Generator, minimum two signs.

2.12 FINISHES

Engine, Generator, Tanks, other Equipment and Accessories: Shop-finished with manufacturer's premium corrosion resistant coating system suitable for corrosive environments; field touch up with same or compatible coating.

Enclosure: Provide with aluminum weather protective enclosure and critical grade muffler. Enclosure shall be Level 2 sound attenuating. Provide with polyurethane enamel paint. Enclosure shall include multiple doors for access to controls and breaker as well as servicing fuel fill oil fill and batteries. Enclosure doors shall be common key lockable. Provide 4 copies of key. Provide intrusion switches on all doors, wired in series, for intrusion alarm contact to field interface terminal blocks at Generator Control Panel. Color shall be desert tan, or as selected by City during submittal stage, submit color options.

2.13 SOURCE QUALITY CONTROL

- A. Factory Testing: Prior to shipment of the new engine/generator equipment to the Project site, factory test the equipment as a complete unit as follows. The Contractor shall notify the City no less than fifteen (15) days prior to the planned factory testing date and time and invite the City to attend and witness the factory testing. The City shall have the option to either attend or waive attendance of the factory witness testing at no additional cost to the City. If the City elects to attend the factory witness testing, travel and subsistence costs associated with the visit shall be the responsibility of the City:
 - 1. Verification that all set-mounted components are correctly installed and interconnected. Perform tests with submitted cooling and exhaust system.
 - 2. Verification that each subsystem is complete and functions according to design criteria; include measurements of temperatures, pressures, and flows for all components.
 - 3. Individual testing of each protective device and verification of the accuracy of instrumentation set points.
 - 4. Operation of the generator unit from 0 to 100 percent load, starting at no load and increasing in increments of 25 percent of the temporary loadbank; check at each load point to verify stable operation, fuel consumption (measure fuel consumption approximately by measuring supply tank drawdown), engine performance, and

generator performance. Perform load test at 0.8 power factor; provide resistive and reactive temporary load bank (sized for total generator kW capacity) to achieve this. Load test unit for minimum 2 hours at each load level. Confirm integral load bank automatically steps to maintain minimum 50% load on generator;

- a. If temporary loadbank is at 0% of generator capacity, the integral automatic loadbank shall step to 50% of generator capacity.
 - b. If temporary loadbank is at 25% of generator capacity, the integral automatic loadbank shall step to 25% of generator capacity.
 - c. If temporary loadbank is at 50% of generator capacity, the integral automatic loadbank shall step to 0% of generator capacity.
 - d. If temporary loadbank is at 75% of generator capacity, the integral automatic loadbank shall step to 0% of generator capacity.
 - e. If temporary loadbank is at 100% of generator capacity, the integral automatic loadbank shall step to 0% of generator capacity.
5. Performance of full load transient tests to verify that voltage and frequency transient characteristics are within accepted submittal values.
 6. Verification that equipment is free of all vibrations throughout operating range.
 7. Provide written report including raw test data, calculated values and a certification that all values are normal and within specifications prior to shipment of the package.
 8. Measure radiator performance at full load including air flow, air inlet temperature and air outlet temperature.
 9. If system fails shop testing and testing is delayed more than 1 day beyond original testing schedule or must be rescheduled after the City arrives for scheduled testing, the Contractor shall pay the City's reasonable travel expenses including transportation, lodging and meals for a follow-up testing visit.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Installation shall be by competent personnel experienced and regularly engaged in field installation of power generation systems.

3.02 FIELD QUALITY CONTROL

- A. Generating System:
 1. The Contractor shall install and anchor the Standby Generator in accordance with submitted and approved seismic anchoring calculations. Seismic anchoring shall be based on manufacturer recommendations but confirmed by registered professional engineer.
 2. Conduit installation shall be coordinated with manufacturer's as-fabricated drawings so that conduit stub-ups are within the area allotted for conduit. Conduit shall be stubbed up in the section that contains the devices to which conductors are terminated.
 3. Contractor shall program and configure Standby Generator controls and Automatic Transfer Switch controls based on submitted and approved parameters.
 4. Installed location and orientation of Standby Generator shall comply with the required working clearances in front of circuit breakers and other electrical equipment that will require service while energized per the NEC, and as approved by City in field.
 5. Grounding and bonding shall be completed as required by applicable sections of the NEC. Bond neutral of Standby Generator, as separately derived system, to grounding

electrode system. Ground Standby Generator to grounding electrode conductor connected to ground rod.

6. Check torque of bolted connections.
 7. Fill Standby Generator cooling and lubrication systems. Refer to manufacturer literature.
 8. Fill the tank with No. 2-D diesel fuel meeting ASTM D 975-60T.
 9. After installation of the engine/generator set is complete, perform full-load test the generating system at the Project site in the presence of the City for a minimum period of 2 hours with the generator connected to a 0.8 power factor reactive/resistive portable load bank (100% of Standby Generator capacity) supplied by the Contractor. During running load test, determine that the installation has been made properly and that there is no undue noise, vibration, oil leaks, water leaks, or overheating. Confirm integral load bank automatically steps to maintain minimum 50% load on generator;
 - a. If temporary loadbank is at 0% of generator capacity, the integral automatic loadbank shall step to 50% of generator capacity.
 - b. If temporary loadbank is at 25% of generator capacity, the integral automatic loadbank shall step to 25% of generator capacity.
 - c. If temporary loadbank is at 50% of generator capacity, the integral automatic loadbank shall step to 0% of generator capacity.
 - d. If temporary loadbank is at 75% of generator capacity, the integral automatic loadbank shall step to 0% of generator capacity.
 - e. If temporary loadbank is at 100% of generator capacity, the integral automatic loadbank shall step to 0% of generator capacity.
 10. The following Field Tests shall be performed by the Standby Generator supplier and witnessed by the Engineer after the full-load reactive/resistive 2 hour test. Confirm proper configuration of controller. Confirm operation of digital displays and configured outputs. Confirm wiring of intrusion switches. Simulate all Standby Generator controls and alarms. Simulate contact closure from ATS to call Standby Generator, run for 15 minutes at 100 percent full load, and remove contact to stop Generator.
 11. After successful completion of the field load bank testing, connect the generator to the Pump Station power distribution system and operate the engine/generator in conjunction with available Pump Station electrical and motor loads for a minimum period of 1 hour.
 12. Correct defects which become evident during testing at no additional cost to the City.
 13. Measure pressures and temperatures of fuel, coolant, exhaust gas, and radiator air at inlets and outlets to system components.
 14. Fuel System Field Test: The Contractor shall submit manufacturer's certifications of pressure test, leak-proof test, and structural integrity test of fuel system. Upon completion of testing, the Fuel Tank shall be filled to maximum capacity. Testing shall be provided by Standby Generator supplier.
 15. Provide final written test report after completion of all successful field testing.
 16. Refill diesel tank.
- B. Consumables: Primary supplier to provide lubricating oil, grease, ethylene glycol, chemical water conditioner. Contractor shall provide sufficient fuel for testing.
1. After successful completion of field testing, fuel tank shall be filled by the Contractor with Ultra Low Sulfur Diesel fuel.
- C. Manufacturer's Field Service:
1. Provide services of a factory-trained engine/generator equipment Manufacturer representative to be present at the Project site to inspect installation of the equipment, oversee the field load bank testing, oversee the Pump Station electrical load testing,

standby power system functional testing and make necessary adjustments, place it in initial trouble-free operation, and instruct the City's personnel on its operation and maintenance. The Contractor shall schedule operation and maintenance training date with the City at least 2 weeks prior to proposed training date.

3.03 SCHEDULE

DIESEL GENERATOR SYSTEM SCHEDULE	
Item	Description
Power Output Rating, kW (KVA)	175 kW (219 KVA), or as approved per submitted load calculations
Output Voltage	480 VAC, 3 wire, 60 Hz
Power Phases	3 phase
Rating Basis	Standby
Manufacturer:	Caterpillar D175-4 (C7.1), or equivalent by Cummins or Kohler, no equal.
Jacket Water Heater: Watts, voltage/phases	Watts per Manufacturer Requirements, 240 VAC, 1 phase
Standby Generator Controls	Skid-Mounted Control Panel
Automatic Loadbank	75 kW
Subbase Fuel Tank	Required, Dual Containment, Seismic Rated
Capacity:	24 hours at 100% load
Weather Proof Acoustic Housing:	Required Residential (Level 2) critical grade, painted white or tan
Maximum Sound Pressure (dBA) at 23 feet:	74 dBA or better
Generator Load Steps:	Load Descriptions:
Load Step 1.1:	Resistive 10 kW
Load Step 1.2:	40 hp SDPS Pump, FVNR, 3 phase 10 hp SLS Pump, FVNR, 3 phase
Load Step 2.1:	40 hp SDPS Pump, FVNR, 3 phase 10 hp SLS Pump, FVNR, 3 phase
Load Step 3.1:	40 hp SDPS Pump, FVNR, 3 phase

END OF SECTION

SECTION 16425
AUTOMATIC TRANSFER SWITCH

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Provide an Automatic Transfer Switch (ATS) complete and operable, within existing Switchboard compartment. Include ATS with controller and all required interconnecting cables and modifications to existing Switchboard, front enclosure door, terminal blocks, and programmable configurations. Provide termination of all existing monitoring from Storm Drain Pump Station PLC.
- B. Existing ATS shall be removed and provided to City. Refer to Section 16050.
- C. The ATS shall be minimum 260 amps, 480 VAC, three phase, three pole, 60 Hz. ATS shall be UL 1008 rated. Contractor to provide all programming configuration of ATS to facilitate operation of Standby Generator, for a complete and operable emergency standby power system.

1.2 CONTRACTOR SUBMITTALS

- A. General: Submittals shall be in accordance with Section 16050 – Electrical Work, General.
- B. Shop Drawings and catalog cut sheets for the ATS shall include but not be limited to:
 - 1. ATS with voltage, current, phases, poles, and short circuit rating as noted within and on Contract Drawings.
 - 2. Bill of Materials summarizing all manufacturers, part numbers and applicable ratings or sizes of all equipment or components provided.
 - 3. Wiring interconnect information.
 - 4. ATS controller configuration data for approval.
 - 5. Field testing procedures.
 - 6. Schematics Drawings.
 - 7. Interconnect Drawings with terminal numbers and wire size capacity.
 - 8. Complete Bill of Materials with Replacement Parts lists.
- C. Operation and Maintenance Manuals: Submit Operation and Maintenance Manuals per Section 16050.

1.3 APPLICABLE CODES AND REQUIREMENTS

- A. As specified in 16050.
- B. IEEE - Institute of Electrical and Electronic Engineers.
- C. NEMA – National Electrical Manufacturers’ Association.
- D. UL – Underwriters’ Laboratories.

1.4 SEISMIC CERTIFICATION

- A. All equipment to be furnished under this contract shall be designed, constructed, and installed in accordance with the earthquake regulations of the California Building Code, Title 24, and the International Building Code (IBC).

PART 2 - PRODUCTS

2.1 GENERAL

- A. Devices of the same type shall be products of the same manufacturer and supplier. This requirement applies to all control devices, and insofar as practical, to equipment manufactured on a production basis. It also applies without exception to equipment custom fabricated for this project.
- B. ATS shall be rated for minimum of 22k AICS at 480 VAC, or greater if required by the Short Circuit Study.
- C. ATS including all components shall be rated for 40° Celsius at full load.
- D. ATS wiring shall be labeled, and furnished per applicable codes and City standard requirements.

2.2 AUTOMATIC TRANSFER SWITCH

- A. Provide ATS with delayed open transition type, UL listed. ATS shall be rated for 480 VAC, 3 pole, 260 amps, contactor based design, minimum 22 KAIC. Provide ATS with alarm and status contacts as standard product per named supplier.
- B. ATS shall be open type for mounting within existing Switchboard. Existing Switchboard ATS section is 24" wide and 90" high.
- C. Functionality: When there is a loss of utility power, the ATS will send a start signal to the engine generator will start after an adjustable time delay. Then, when the engine generator is ready to receive the load (on and running at rated voltage and phase), the loads will be transferred to the engine generator after an adjustable time delay. Upon a return of utility power, the load will be transferred back to the utility after an adjustable time delay. The transfer back to the utility will be open transition. Provide an adjustable engine cool-off time delay.
- D. Provide controller with Modbus serial communication. Provide with standard alarm contacts wired to field terminal strips, including but not limited to: ATS in Standby (Emergency) Position, and Utility Power Fail.
- E. ATS shall be Eaton Contactor Based 260 Amp ATS, open transition type, with ATC-300 controller with Modbus serial, no equal.

2.3 FACTORY ACCEPTANCE TESTS

- A. ATS shall be given Manufacturer's standard electrical and mechanical production tests and inspections.
- B. Factory Acceptance Testing (FAT) results shall be submitted and included in O&M Manual.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install ATS in accordance with supplier's published instructions conforming to these Contract Documents.
- B. If stored at the site, ATS shall be stored in a clean, dry space. Factory wrapping shall be maintained or an additional heavy plastic cover shall be provided to protect units from dirt, water, construction debris, and traffic.
- C. ATS shall be handled carefully to avoid damage to components, enclosure, and finish. Damage shall be repaired before installation.

3.2 INSTALLATION

- A. ATS shall be anchored to existing Switchboard. Provide modifications to front door to install new ATS controller and blank off existing openings. Terminate existing wires to new ATS.
- B. Torque all bolts to Manufacturer's recommendations.
- C. Contractor to configure ATS and confirm operation with approved Standby Generator. Verify contact status to Pump Control Panel.
- D. Coordinate interconnects between ATS and Pump Control Panel and Standby Generator and existing Storm Drain Pump Station PLC. Some signals from Standby Generator to Pump Control Panel shall be routed thru ATS; provide terminals for these signals at ATS.

3.3 FIELD TESTS

- A. Visual and mechanical inspection after installation shall include:
 - 1. Inspect for physical damage, proper anchorage and grounding.
 - 2. Check tightness of bolted connections.
- B. Electrical Tests
 - 1. Insulation tests:
 - a. Measure insulation resistance of phase to phase and phase to ground for one minute. Test voltage and minimum acceptable resistance shall be in accordance with Manufacturer's recommendations.
 - 2. Verify proper operation of controls in all modes of control for ATS.
- C. NETA testing of ATS.
- D. Coordinate with City to schedule shutdown for ATS removal and installation of new ATS. Provide two week notice for City approval of shutdown. Shutdown schedule shall be limited between Tuesdays thru Thursdays, 9:00 am to 3:00 pm. Shutdown duration shall not exceed six hours. Contractor shall provide temporary back up power source to power sewage lift station during shut down.
- E. ATS Field Test: the following Field Tests shall be performed by the ATS supplier and witnessed by the Engineer. Confirm proper configuration of controller. Simulate all controls

and alarms. Simulate power failure and call to exercise Standby Generator from Automatic Transfer Switch. Run Standby Generator for 15 minutes. ATS shall be field tested on same day or next day after installation.

- F. Provide additional testing as outlined in Specification 16950 – Electrical Testing.
- G. All testing shall be witnessed by the Engineer and/or City. All testing sheets shall be signed off by the Engineer and/or City to be considered valid.
- H. Refer to Section 16050 for further testing requirements.

END OF SECTION

SECTION 16431
PROTECTIVE DEVICE STUDIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Perform the following protective device studies for the electrical power system in accordance with the Contract Documents: Short Circuit Study and Arc Flash Study. Studies to include existing utility service, existing Switchboard main breaker, Standby Generator with integral breaker, existing Storm Drain Pump Station MCC, and new Pump Control Panel. Provide Short Circuit Study and Arc Flash Study for two scenarios: Scenario 1 while powered from utility, Scenario 2 while powered from Standby Generator.
- B. A Short Circuit Study shall be prepared and submitted to verify the suitability of submitted equipment short circuit and arc flash ratings and allow for Engineer approval. The Short Circuit Study shall cover the maximum available 3-Phase Faults and line-to-ground faults based on installed equipment and cables.
- C. The Arc Flash Study shall calculate maximum available fault current to establish Arc Flash label information as required by NEC and these Specifications.
- D. Contractor is responsible to obtain from PG&E the information required to perform all of the studies. Submit same information from PG&E to Engineer.
- E. Obtain from field and from appropriate vendors the information required to perform all the studies. Contact the protective device manufacturers and obtain the ratings and time current curves for all protective devices including existing and new: circuit breakers, motor circuit protectors, and overload protective elements.
- F. Perform all needed field investigation and inspections to properly identify existing equipment including motors, installed cable sizes, and any appropriate settings and nameplate data to get the correct information to work with. This includes but is not limited to voltage ratings, impedance, cable lengths for final studies submittal.
- G. Arc Flash labels must be installed prior to Field Testing.
- H. After the facilities are built and operating, all comments on the studies and studied equipment shall be addressed and all corrections made to input data and the studies submittal for Record Set. The Record Set of the studies shall include all calculations rerun, copies of arc flash labels, tabulations corrected, and reports adjusted reflecting the post Field Tested as-built equipment with as left settings. Provide electronic files of study from SKM software. Submit per O&M Manual guidelines with Contract specifications.

1.2 QUALIFICATIONS

- A. The studies and analysis shall be performed using the latest version of the SKM Systems Analysis Power Tools for Windows (PTW) software program.
- B. The Short Circuit and Arc Flash studies shall be thoroughly reviewed, stamped and signed by an electrical engineer who is registered in the state of California, full time employee of the approved firm, who has experience performing short circuit and arc flash studies, and

who directly supervised the collection of information, the creation of the studies and the furnishing of reports.

- C. The Registered Professional Electrical Engineer shall have a minimum of five (5) years of experience in performing power system studies.
- D. The engineering firm shall demonstrate experience with Arc Flash Hazard Analysis by submitting names of at least five actual arc flash hazard analysis it has performed in the last five years.

1.3 CONTRACTOR SUBMITTALS

- A. Studies shall be submitted in accordance with Section 16050 – Electric Work, General.
- B. Copy of Arc Flash labels inscriptions, with a description of the installed location, shall be submitted and approved prior to energizing equipment. Labels shall meet City requirements.
- C. The protective device studies, reports, settings, calculations, plots and tabulations shall be performed in a timely matter and included in the Contractor’s schedule. The Record Set shall be submitted with the O&M Manual, as a separate submittal after all comments, corrections, updated input data, and as left settings have been inserted into the software programs to produce an as-built set of studies, reports, settings, calculations, labels, plots and tabulations.
- D. A CD disk of the as-built set of studies, reports, calculations, and tabulations utilizing SKM software.
- E. A separate CD disk of the original source format of input data used as direct input to the selected software to perform the calculations, generate the reports, generate the tabulations, and list the device settings for the as-built facilities.
- F. Resume of electrical engineer performing the Protective Device Study.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

- A. The study shall include single-line and impedance diagrams of the power system. This diagram shall identify all components considered in the study and the ratings of all power devices, including circuit breakers, fuses, busses, and cables. The resistances and reactances of all cables shall be identified in the impedance diagram. The study shall contain all written data from the electric utility company regarding maximum available short circuit current, voltage, and X/R ratio of the utility power system.
- B. The study shall include all protective devices and feeders included under this Contract. The utility (PG&E) short circuit information and overcurrent protective device and ground fault protective device shall be used as a fixed reference and starting point for these studies.
- C. The study shall be performed for the following scenario:
 - 1. Facility fed from utility power using the maximum available fault current from the utility with all loads on and then with all loads off.

2. Facility fed from Standby Generator power using the maximum available fault current from the utility with all loads on and then with all loads off.
- D. The work shall be performed in the following sequence:
1. A Preliminary Short Circuit Study.
 2. Submit electrical equipment with short circuit rating greater than maximum available fault current per Preliminary Short Circuit Study.
 3. Protective Device Studies submitted: Short Circuit Study, and Arc Flash Study, as approved by the City and the Engineer.
 4. Install approved arc flash labels on equipment.
 5. Provide Electrical Testing per Section 16950 – Electrical Testing.
 6. Energize equipment. Equipment shall not be energized until Sequence Steps 1 through 5 above are completed and approved by the City and the Engineer.
 7. Provide further testing including, but not limited to manufacturer recommended field testing, 7 day “live testing”, and as required by the Specifications.
 8. Update and replace arc flash labels on equipment if protective device settings are modified during testing and start-up phase.
 9. Complete Record Set of Protective Device Studies, approved by the City and the Engineer.

3.2 SHORT CIRCUIT STUDY

- A. The Short Circuit Study shall be performed with the aid of a digital computer program, and shall be in accordance with:
1. ANSI/IEEE 141 – Recommended Practice for Electrical Power Distribution for Industrial Plants
 2. ANSI/IEEE 242 – Recommended Practice for Protection, and Coordination of Industrial, and Commercial Power Systems
 3. ANSI/IEEE C 37.13 – Low-Voltage AC Power Circuit Breakers Used in Enclosures
- B. The Short Circuit Study shall be performed to determine the adequacy of circuit breakers, and fuses. Any problem areas or inadequacies in the equipment due to prospective short-circuit currents shall be promptly brought to the Engineer's attention.
- C. The Short Circuit Study shall include:
1. Single line diagram for each scenario with the incident energy shown at each bus.
 2. Tabulations of electrical capacities and characteristics of the equipment and protective devices.
 3. Table comparing the calculated short circuit and the equipment ratings for each scenario.
- D. Do not utilize series-rated circuit breakers to meet short circuit requirements for this project. Devices shall be fully rated to withstand available fault currents.
- E. As-built the Short Circuit Study and rerun and adjust all the reports, calculations, device settings and output tabulations for all the protective devices reflecting the as-built facilities

after all corrections have been inserted into the input data and all previous comments have been addressed.

3.3 ARC FLASH STUDY

A. The Arc Flash Study shall be performed with the aid of a digital computer program to cover the whole power distribution system. The Arc Flash Study shall calculate, determine and report the “Arc Flash Boundary” incident energy at 18 inches expressed in cal/sq-cm, voltage shock hazard, limited shock approach boundary, restricted shock approach boundary, prohibited shock approach boundary and “Personal Protective Equipment” (PPE) level. The Arc Flash Study shall calculate and determine these items for electrical equipment in the power distribution system study. The Arc Flash Study shall be performed in conjunction with short circuit calculations and protective device coordination. The Arc Flash Study shall be done for worst-case analysis, considering minimum/maximum utility fault current and with motors either on or off. The Arc Flash Study shall be in accordance with the latest version of:

1. NFPA 70E – Standard for Electrical Safety Requirements for Employee Workplaces
2. IEEE 1584 – Institute of Electrical and Electronics Engineers (IEEE) guide for performing Arc Flash Hazard Calculations
3. OSHA (29 CFR PART 1910) – Occupational Safety and Health Standards for General Industry
4. ANSI Z535.1 – Safety Color Code
5. ANSI Z535.3 – Criteria For Safety Symbols
6. ANSI Z535.4 – Product Safety Signs and Labels

All calculation shall be performed in accordance with IEEE 1584. The use of thumb rules is not acceptable in place of a calculated value as shown in IEEE 1584.

B. The study shall determine and report the following: The recommended values for the “Arc Flash Boundary” incident energy at 18 inches expressed in cal/sq-cm, voltage shock hazard, limited shock approach boundary, restricted shock approach boundary, prohibited shock approach boundary and PPE levels, based on the Arc Flash Study results. These results shall be tabulated with all identified equipment or short circuit interrupting items in the short circuit and coordination study.

C. The study shall recommend the Personal Protective Equipment (PPE) that the City should maintain on site for standard maintenance and operations expected to be conducted for this electrical system. The study shall recommend the safety label design that should be posted on electrical equipment. The study shall recommend the specific information that should be typewritten as part of the safety label. Label information shall also be coordinated with City requirements during submittal period. These recommendations shall be based on the National Electrical Code (NEC) requirements, Occupational Safety and Health Administration (OSHA) standards, and National Fire Protection Association (NFPA) recommended practices. Furnish and install the field markings required by the NEC for Flash Protection on all power distribution equipment. The field marking shall be the approved recommended safety label.

- D. Arc Flash Hazard warning stickers shall be sized 4" x 6". These labels shall be 3 mil matted vinyl film with a pressure sensitive adhesive and be resistive to moisture, solvents, and UV light. The label shall include the following information, at a minimum:
1. Bus location designation which shall be easily identified from the single line drawing.
 2. Nominal voltage
 3. Flash protection boundary in inches
 4. Incident energy in cal/cm²
 5. Glove class
 6. Limited and restricted approach in inches
 7. Working distance in inches
 8. Name of the City facility and date.
- E. All labels will be based on recommended overcurrent device settings and will be provided after the results of the analysis have been presented to the City and after any system changes, upgrades or modifications have been incorporated in the system.
- F. Labels shall be machine printed, with no field markings.
- G. Arc flash labels for dangerous conditions shall also state the following:
1. "No Safe PPE Exists"
 2. "Energized Work Prohibited"
 3. "Do Not Work On Live"
- H. As-build the Arc Flash Study and rerun and adjust all the reports, calculations, and adjust the PPE recommendation reflecting the as-built facilities after all corrections have been inserted into the input data and all previous comments have been addressed.

3.4 RECORD SET

- A. The results of the power system studies shall be summarized in a Record Set. Submittal shall follow guidelines of O&M Manual and as described below. The Record Set shall include the following:
1. Single-line diagram.
 2. Impedance diagram for 3-Phase Faults.
 3. Impedance diagram for line to ground faults.
 4. Tabulation of all protective devices for 3-Phase Faults, which shall be identified on the single line diagram.
 5. Tabulation of all protective devices for line to ground faults, which shall be identified on the single line diagram.
 6. Computerized 3-Phase Fault current calculations.
 7. Computerized line to ground fault current calculations.
 8. Recommended settings to achieve < 8 cal/sq-cm; or specific recommendations on how to mitigate all locations to < 8 cal/sq-cm (Item 13 below).

9. Motor starting inrush current plotted on the associated time current protective curves.
 10. Sensing instrumentation, condition, and connections, as applicable, for each study.
 11. Arc Flash Study report including tabulations, label design and recommendations.
 12. Tabulation of all power distribution measuring, control, monitoring, communication and setup device settings.
 13. Specific recommendations shall include how to potentially reduce the arc-flash incident-energy levels for each location having more than 8 cal/sq-cm present. Include a budgetary estimate for implementing any proposed change.
- B. The Record Set shall include information concerning the computer program used for the study and also shall include a general discussion of the procedure, items, and data considered in preparing the study.
 - C. The Record Set shall include electronic CD disks as well as hard paper copy form of all input data, all calculation reports, all plotted curves, all drawings, all output data, and all device settings in tabulated organized form. Submit the final model with scenarios in original source format on a separate CD that can be utilized by the City.
 - D. Work shall be completed as part of field testing and equipment acceptance per Section 16050.

END OF SECTION

SECTION 16450
GROUNDING

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. Provide the electrical grounding system, complete and operable, in accordance with the Contract Documents.
- B. The requirements of Section 16050 – Electrical Work, General apply to this Section.
- C. Single Manufacturer: Like products shall be the end product of one manufacturer in order to achieve standardization of appearance, operation, maintenance, spare parts and manufacturer's services.
- D. The grounding electrode conductor system is intended to provide a low resistance path to earth ground. Acceptable ground system resistance is 5 ohms or less. Provide and install additional ground rods as needed until acceptable resistance is achieved.
- E. Coordinate, provide, and install bonding and grounding system, as required by NEC and Contract Drawings, at the Standby Generator and Termination Cabinet.

1.2 CONTRACTOR SUBMITTALS

- A. General: Submittals shall be in accordance with the requirements of Section 16050 – Electrical Work, General.
- B. Shop Drawings: Manufacturer's product information for connections, clamps, and grounding system components, showing compliance with the requirements of this Section.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All components of the grounding electrode conductor system shall be manufactured in accordance with American National Standards Institute (ANSI)/UL 467 – Standard for Safety Grounding and Bonding Equipment, and shall conform to the applicable requirements of National Electrical Code (NEC) Article 250 and local codes. The minimum size shall be as outlined in National Electrical Code.
- B. There shall be an equipment grounding conductor in each raceway.

2.2 GROUNDING ELECTRODE SYSTEM

- A. Grounding electrode conductors shall be bare, stranded, copper conductors suitable for direct burial. Conductors shall be #2/0 AWG minimum, unless indicated otherwise.
- B. Ground rods shall be copper-clad steel, 3/4-inch diameter and 10 feet long conforming to UL 467. Electrolyte copper 10 mils thick shall be mechanically bonded to the rigid steel core.
- C. Cable-to-cable connections and all concealed connections shall be made using irreversible compression connectors.

2.3 GROUND ROD BOXES

- A. Boxes shall be precast, high density, reinforced concrete, traffic rated, measuring a 10-inch interior diameter at the top and 12 inches deep. Covers shall be cast iron. All covers shall include special markings: "GROUND".
- B. Boxes and covers shall be manufactured by Christy Concrete G03, or equal.

PART 3 - EXECUTION

3.1 GROUNDING

- A. General: When sizes are not specifically indicated on the drawings, grounding cable shall be sized in accordance with all applicable code requirements. The location of ground rods shall be as indicated. The lengths of rods forming an individual ground array shall be equal and shall be of the quantity required to obtain a ground resistance of no more than two ohms. Measured resistance may be required to be less than five ohms where specific code or utility requirements apply. The grounding system shall be in strict accordance with Article 250 of the NEC.
- B. Equipment Grounding System: Ground continuity throughout the facility shall be maintained by means of an equipment grounding conductor run in all conduits. Equipment grounding conductors which are run in conduit shall be insulated copper conductors, sized in accordance with the NEC and the drawings, whichever is larger. Conductors shall meet the requirements of Section 16120 – Wires and Cables.
 - 1. Insulated throat grounding fittings shall be employed for all equipment grounding connections. Routed equipment grounding conductor through insulated throat grounding fitting, or bond fitting to equipment ground bus with same size jumper as equipment ground conductor contained within conduit.
 - 2. Completely remove all paint, dirt, or other surface coverings at grounding conductor connection points so that good metal-to-metal contact is made.
- C. Grounding Electrode System: Install the grounding electrode conductor system with all required components in strict accordance with National Electrical Code Article 250 and the Contract Drawings.
 - 1. Connection to grounding electrodes conductors shall be compression connectors where concealed or below grade, and shall be bolted pressure type where exposed and above grade or within ground well. Bolted connectors shall be assembled wrench tight to manufacturer's requirements.
 - 2. Grounding electrode conductors that make up the ground grid shall have a minimum buried depth of 36 inches below finished grade.
 - 3. Bond all exposed structural members and metallic enclosures of electrical equipment to ground grid. This includes new ATS, Standby Generator, Termination Cabinet, Pump Control Panel, antenna pole, and generator receptacle. Grounding connections to equipment shall be compression lug mechanical connection type.
 - 4. Standby Generator main bonding jumper and system bonding jumpers shall be sized per the requirements of National Electrical Code Article 250, or as shown, whichever is larger.

5. Install sufficient ground rods in addition to code-required grounding so that resistance to ground as tested by standard methods does not exceed five ohms unless otherwise approved in writing by the Engineer. Where more than one rod is required, install rods at least 10 feet apart. Set ground boxes flush with grade or slab.
 6. Bond neutral at Standby Generator to grounding electrode system.
 7. In ground rod boxes, install ground rod with one end exposed six inches above backfill with compression connection of grounding electrode conductors fully visible and accessible.
- D. Shield Grounding
1. Shielded instrumentation cable shall be grounded at one end only; this shall typically be at the Pump Control Panel.
 2. Termination of each shield drain wire shall be on its own terminal screw. All of these terminal screws in one rack shall be jumpered with No. 16 solid tinned bare copper wire. The connection to the ground shall be accomplished with a No. 12 green insulated conductor to the main ground bus.

3.2 FIELD TESTS

- A. All grounding shall be installed prior to start of field testing.
- B. All field tests to be witnessed and signed off by the Engineer.
- C. In the Engineer's presence, test the ground resistance of the grounding system using the Institute of Electrical and Electronics Engineers (IEEE) "Fall of Potential Method."
- D. Test all ground fault circuit interrupter (GFCI) receptacles and/or GFCI circuit breakers for proper connection and operation with methods and instruments prescribed by the manufacturer.
- E. Provide copies of reports of all grounding system tests for inclusion in Operation and Maintenance Manuals and for review by the Engineer.
- F. Refer to Specification 16950 – Electrical Testing for further testing requirements.
- G. Grounding tests shall be completed and approved prior to energizing electrical equipment
- H. Perform this testing as part of the field testing and equipment acceptance per Section 16050.

END OF SECTION

SECTION 16500
LIGHTING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. The Contractor shall provide all lighting fixtures, lighting poles, lighting pendants, cabling, conduits and accessories for a complete and operable lighting system, in accordance with the Contract Documents.
- B. Contractor shall coordinate location of Control Building light fixtures and mounting heights as not to interfere with other equipment, provide for even light distribution, illuminate working tasks, etc. Inspector to field approve final lighting fixture positions and mounting heights, as determined by the Contractor, based on equipment supplied and installation means.

1.02 CONTRACTOR SUBMITTALS

- A. General: Submittals shall be in accordance with the requirements of Section 16050 – Electrical Work, General.
 - 1. Catalog literature for each fixture.
 - a. Materials of construction, type of diffusers, hardware, gaskets, reflector and chassis, finish, and electronics.
 - b. Submit mounting hardware.
 - c. Luminaries: Submit technical photometric data for each luminaries, including IES lighting classification and isolux diagram. Submit fastening details of luminaries to structure and method of fastening.
- B. Submit site light pole base reinforcement and concrete design. Include reinforcement bar type, spacing, and quantities. Include concrete strength. Submittal shall include detail for construction.
- C. Substitutions for specified fixtures: Contractor shall provide a sample of the specified luminaries and the proposed substituted luminaries for each proposed substitution. Substitutions will be accepted only if judged equal or better in performance characteristics, construction quality, ease of maintenance, and aesthetic appearance by City and Engineer.

1.03 QUALITY ASSURANCE

- A. Lighting fixtures shall be stored in their original cartons from the manufacturers until the time of installation.

1.04 CLEANUP

- A. Fixture lenses, diffusers, and reflectors shall be cleaned just prior to the system demonstration test.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Provide luminaires as shown in Fixture Schedule. Provide luminaires with all electrical components easily accessible and replaceable without removing the luminaries.

- B. Refer to Section 16140 – Wiring Devices for Storm Drain Pump Station flood light spring wound timer switch and lockable cover, Timer switch and cover are to be pole mounted.
- C. Special Requirements
 - 1. Contractor shall install appropriate fittings provided by the luminaries' manufacturer to make the assembly complete.
 - 2. Provide outdoor luminaires with “Suitable For Wet Locations” label.

PART 3 - EXECUTION

3.01 LUMINAIRES

- A. General
 - 1. Install each luminaire in a manner recommended by the luminaire manufacturer and accepted by the Engineer.
 - 2. Be responsible for handling the luminaires, installing plumb and level, and keeping luminaires clean.
 - 3. After construction of total project is completed, remove all labels and other markings, wash dirty luminaires inside and out with a nonabrasive mild soap or cleaner. Clean luminaries' plastic lenses with antistatic cleaners only. Touch up all painted surfaces of luminaires with high-grade exterior enamel, and poles with paint supplied by manufacturer.
 - 4. Provide and install all fixtures complete, including lamps, and ready for service.
 - 5. Deliver all warranty paperwork to Engineer.
 - 6. Locate Control Building exterior site light to shine on wet well. Orient pole mounted flood light to shine on existing Storm Drain Pump Station.

END OF SECTION

SECTION 16950
ELECTRICAL TESTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. This Section specifies the work necessary to test, commission and demonstrate that the electrical work satisfies the criteria of these specification and functions as required by the Contract Documents.
- B. Testing shall follow the procedures as outlined in the latest edition of the InterNational Electrical Testing Association Acceptance Testing Specifications, including optional testing. Electrical Field Testing is also referenced as NETA Testing, or Field Testing.
- C. Testing shall confirm the following:
 - 1. That equipment is operational within industry and manufacturer's tolerances.
 - 2. That equipment is installed in accordance with the Contract Documents.
 - 3. That equipment is suitable for energization and acceptance per NETA standards.

1.2 GENERAL

- A. The work of this Section includes furnishing the labor, equipment, and power required to support the testing specified in this and other sections of the Specification. Electrical testing specified in Division 16 and functional testing of all power and controls not tested under Division 17 shall be completed before commencement of start-up testing. This scope of work may require the activation of circuits, shutdown circuits, run equipment, take electrical measurements, replace blown fuses, install temporary jumpers, etc.
- B. Provide support to disconnect and reconnect cables, and perform any other functions required to test electrical equipment.
- C. Electrical tests shall be performed by third party, NETA certified, testing agency. All electrical testing shall be witnessed by the City and Engineer to be considered valid.
- D. All electrical testing performed per this Section shall be done during field testing period, prior to 7 day Demonstration Test.

1.3 SUBMITTALS

- A. Testing Company NETA certification.
- B. Test technician's resumes.
- C. Submit Testing Company testing forms for approval. Testing forms shall be based on InterNational Electric Testing Association's (NETA) latest Acceptance Testing Specifications having a sign-off (tester and witness), pass/fail status, data filed for each line item covered by NETA's Acceptance Testing Specifications latest edition.
- D. Results of all testing shall be submitted to the Engineer prior to final project acceptance. Results to be included as part of final O&M Manuals. Results shall describe test conditions, weather (including temperature and humidity), test date, duration of test, test equipment,

tested equipment, testing technician, “as found” and “as-left” results, expected results, actual results, pass/fail status based on listed testing standards.

- E. Testing agency engineer to submit confirmation that “equipment is ready to be energized”. Confirmation shall be on company letterhead with name, signature and stamp of responsible Professional Engineer of Testing Agency.

1.4 TESTING AGENCY QUALIFICATIONS AND TESTING SCOPE

- A. NETA testing shall be performed by an independent third party testing organization who has been regularly engaged in the testing of equipment for a period of at least five (5) years and has full membership certification issued by NETA. All testing shall be conducted by technicians whom are regularly employed by the testing company whom will prepare and sign test reports with values, recommendations, comments, pass/fail status, as well as ready for energization confirmation letter.
- B. Testing equipment required to conduct the specified tests shall be furnished by the NETA testing organization. Testing equipment shall be in good working condition and comply with the requirements of this Specification and applicable industry standards.
- C. Testing equipment shall have valid calibration sticker during testing.
- D. Testing shall be done in accordance with the manufacturer's instructions, these Specifications, and NETA Acceptance Testing Specifications, NEMA, ANSI, NFPA, and ASTM Standards. All testing shall be done in the presence of the Engineer, and forms shall include space for Engineer sign-off at time of test.
- E. Testing organization shall be Apparatus Testing and Engineering, or equal.
- F. The testing organization shall be responsible for testing, and verification of results for equipment listed below:
 - 1. Automatic Transfer Switch.
 - 2. Standby Generator; including main and loadbank breakers.
 - 3. Cables shall be tested by Contractor after pulling and prior to termination. Refer to Section 16120 – Wires and Cables. Testing organization is responsible to review results, provide pass/fail evaluation and include results submittal.
 - 4. Grounding System: Test for ground system resistance at Standby Generator and Termination Cabinet.

1.5 NETA FIELD TESTING REQUIREMENTS

- A. The following test requirements are intended to supplement test and acceptance criteria that may be stated elsewhere:
 - 1. ATS:
 - a. Perform Field Testing on ATS per applicable sections of NETA Standards on ATS.
 - 2. Standby Generator:
 - a. Perform Field Testing per applicable sections of NETA Standards on Standby Generator, breaker, and grounding.

3. Cables Megger (#10 AWG and larger) – to be performed by Contractor:
 - a. Perform Field Testing per NETA Standards.
 - b. Refer to Section 16120 – Wires and Cables for additional testing.
4. Grounding System:
 - a. Perform Field Testing per NETA Standards on new ground wells at Standby Generator and Termination Cabinet.
 - b. Refer to Section 16450 – Grounding for additional testing.

1.6 TESTING SEQUENCE

- A. Refer to Section 16431-3.1.D for testing sequence.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 TESTING

- A. All testing shall be witnessed and signed-off by the City and/or Engineer to be valid. Each test sheet must be signed-off prior to submittal.
- B. After equipment is tested and approved, testing organization shall apply sticker on equipment noting date of test and initial of tester.
- C. Field testing period shall include all NETA Field Testing, and manufacturer recommended testing and testing requirements listed in equipment specification sections. Field testing shall be completed prior to starting 7 day Demonstration Test.

END OF SECTION

SECTION 17100
PROCESS CONTROL AND INSTRUMENTATION SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Provide all Process Control and Instrumentation Systems (PCIS) complete and operable, in accordance with the Contract Documents. The PLC shall be furnished by the Contractor, yet programmed by the City's Programmer ArcSine Engineering outside of this contract. The City's Programmer shall also configure the Contractor furnished radio, and the Contractor furnished SCADA Workstation and associated software.
- B. The Contractor shall deliver the PLC, radio, antenna, and SCADA Workstation (Refer to Section 16050 - Electrical Work, General, paragraph 2.3) to ArcSine within 12 weeks after Notice to Proceed, for programming, configuration and testing. Deliver SCADA Workstation hardware and software to ArcSine Engineering, Attention Ms. Kendra Bradley, City to provide address for delivery. Contractor to request address prior to shipping. ArcSine Engineering shall deliver PLC, radio, and antenna back to Contractor within four weeks of receiving hardware. ArcSine Engineering will deliver and install SCADA Workstation on site.
- C. The requirements of this Section apply to all components of the PCIS unless indicated otherwise. The requirements of Division 16 apply to all components of Division 17.
- D. Responsibilities:
 - 1. Provide, install, label, terminate, configure, test and start up all field instruments.
 - 2. Design, provide, install, label, terminate, program, configure, test and start up the Pump Control Panel, including wet well level digital meter. Provide all field wiring terminations at Pump Control Panel. Coordinate programmed ranges and PLC registers, with City's Programmer.
 - 3. As a minimum perform the following work:
 - a. Implementation of the PCIS.
 - 1) Prepare instrument submittals. Include spare parts.
 - 2) Design, develop, and electronically draft Interconnect Diagrams, Pump Control Panel Drawings (Schematics, PLC Wiring, Panel Elevations), and Instrument Installation Details.
 - 3) Interconnect Diagrams shall include information required for installation of field cables between equipment. Interconnect Diagrams shall include cable quantities, cable sizes, cable labeling information, cable insulation color, termination block labels, conduit sizes, and conduit labels information. Show all pull boxes, handholes, j-boxes, etc. Wires may be pulled prior to Interconnect Diagrams approval at Contractor risk. No wiring shall be terminated prior to approval of Interconnect Diagrams.

- 4) Instrument Installation Detail shall include information for installation of each supplied instrument. Show cable supporting hardware, cable securing, switch tripping elevations, etc.
- 5) Prepare drawings for submittal review and as-built record drawings. All drawings shall be done in PDF and AutoCAD format for all submittals.
- 6) Procure hardware.
- 7) Submit Instrumentation Supplier certifications that installed instruments are per manufacturer specifications.
- 8) Submit Pump Control Panel supplier that shop is UL-508A certified.
- 9) Prepare and submit Factory and Field Testing procedures and results to confirm Pump Control Panel inputs and outputs to field devices are functional, and wet well level digital meter is operational with setpoints configured.
- 10) Submit hard copy of wet well digital meter configurations.
- 11) Work with City to verify PLC inputs and outputs correspond with PLC program and SCADA system. Contractor to provide 8 hours in bid to perform this work.
- 12) Prepare Operation and Maintenance Manuals in hardcopy and electronic (PDF) formants for supplied instruments. As-built drawings shall be provided in PDF and AutoCAD formats. Include Interconnect Diagrams, Pump Control Panel Schematic Diagrams and scaled Elevation Diagrams (panel door front and interior). Also submit wet well digital meter configuration, and Factory and Field Test sheets in O&M Manuals.

1.2 CONTRACTOR SUBMITTALS

- A. General: Submittals shall be furnished in accordance with Section 16050 Electrical Work, General, and the following:
 1. Coordinate the instrumentation work so that the complete instrumentation system will be provided and will be supported by accurate shop drawings and record drawings.
 2. Symbology and Nomenclature: In these Contract Documents, all systems, all meters, all instruments, and all other elements are represented schematically, and are designated by symbology as derived from Instrument Society of America Standard ANSI/ISA S5.1 – Instrumentation Symbols and Identification. The nomenclature and numbers designated herein and on the Drawings shall be employed exclusively throughout shop drawings, and similar materials.
- B. Shop Drawings
 1. General:

- a. All shop drawings shall include the letter head or title block of the Instrumentation Supplier. The title block shall include, as a minimum, the Instrumentation Supplier's registered business name and address, project name, drawing name, revision level, and personnel responsible for the content of the drawing.
- b. Organization of the shop drawing submittals shall be compatible with eventual submittals for later inclusion in the O&M Manual.
- c. Shop drawing information shall be bound in standard size, 3-ring, loose leaf, vinyl plastic, hard cover binders suitable for bookshelf storage. Binder ring size shall not exceed three (3) inches.
- d. All shop drawings shall be in hardcopy and electronic PDF along with AutoCAD drawings. Electronic submittal shall have both PDF and AutoCAD versions of all drawings.

2. Hardware and Drawing Submittal:

- a. A complete index which lists each device. A separate technical brochure or bulletin shall be included with each instrument data sheet. The data sheets shall be indexed in the submittal by specification section.
- b. Instrument Installation Details for each specific instrument shall be submitted in PDF format and an electronic AutoCAD version. Each instrument shall have a dedicated 8½-inch x 11-inch detail which only pertains to the specific instrument. Each detail shall be certified by the instrument manufacturer that the proposed installation is in accordance with the instrument manufacturer's recommendations and is fully warrantable.
- c. Pump Control Panel drawings including: scaled panel elevation and layout drawings (Panel door and interior), schematic diagrams, PLC wiring diagrams, bill of materials, and component catalog cut sheets. Also submit Factory Test procedures for review.
- d. Fully executed instrument data sheets according to ISA-S20 – Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves, for each component, together with a technical product brochure or bulletin. The technical product brochures shall be complete enough to verify conformance to all Contract Document requirements. The data sheets, as a minimum, shall show:
 - 1) Component functional description.
 - 2) Manufacturer's model number or other product designation.
 - 3) Instrument tag number per Contract Drawings, if applicable. Reference installation detail.
 - 4) Project location or assembly at which the component is to be installed.
 - 5) Input and output characteristics.

- 6) Scale, range, units, and multiplier (if any).
 - 7) Requirements for electric supply (if any), communication protocol (if any), signals.
 - 8) Materials of component parts to be in contact with or otherwise exposed to process media and corrosive ambient air.
 - 9) Special requirements or features.
 - 10) Local supplier including contact name, phone number, and address.
- e. Priced list of manufacturer recommended spare parts for all devices.
 - f. Priced list of spare parts for all devices.
 - g. All drawings shall be done in 11-inch x 17-inch PDF and AutoCAD with 0.0625-inch minimum text height.
3. Test Procedure Submittals: Submit the factory and field testing procedures for approval. Submit results for review and inclusion in O&M Manuals. All testing results to include a City or Engineer signature as witness.
- C. Operation and Maintenance Manual
1. General: Information in the O&M Manual shall be based upon the approved shop drawing submittals as modified for conditions encountered in the field during the work.
 2. The O&M Manuals shall be organized and contain information as outlined in specifications.
 3. Signed and certified results from all testing shall be included in O&M Manuals.
- D. As-Built Drawings
1. All such drawings shall be submitted and approved prior to beginning of 7 day Demonstration Test.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Code and Regulatory Compliance: All PCIS work shall conform to the National Electrical Code. Conflicts between the requirements of the Contract Documents and any codes or referenced standards or specifications shall be brought to the attention of the Engineer.
- B. Hardware Commonality: All instruments which utilize a common measurement principle (for example, float switches) shall be furnished by a single manufacturer. All panel mounted instruments shall have matching style and general appearance. Instruments performing similar functions shall be of the same type, model, or class, and shall be from a single manufacturer.
- C. Instrument and Loop Power: Instrument power requirements and input/output connections for all components going to Pump Control Panel shall be compatible with PLC. Power for transmitted signals shall, in general, originate in and be supplied by the control panel devices.

The use of "2-wire" transmitters is preferred, and use of "4-wire" transmitters shall be minimized.

2.2 OPERATING CONDITIONS

- A. The PCIS shall be designed and constructed for satisfactory operation and long, low maintenance service under the following conditions:
 - 1. Environment – Sewage lift station
 - 2. Temperature Range – 32 through 110 degrees F
 - 3. Relative Humidity – 20 through 90 percent, non-condensing

2.3 SPARE PARTS AND SPECIAL TOOLS

- A. All spare parts and special tools shall be provided on site before startup commences, suitably wrapped and identified. Provide spare parts in original manufacturer containers.

2.4 FACTORY AND FIELD TESTING

- A. Coordinate and schedule with City for factory and field testing. Contractor is responsible to provide two-week notice to City, and Engineer for scheduled testing.
- B. Test forms shall be submitted and approved prior to testing.
- C. Factory and Field tests shall be witnessed and signed off by the City and Engineer to be considered complete. Any test results without the City's and Engineer's signature are considered invalid and will be done again.

2.5 INSTRUMENT IDENTIFICATION

- A. Submit list of instruments, each with tag inscription and tag materials for approval by the City and the Engineer. Tags shall be engraved stainless steel plates, with 1/4-inch lettering. Inscriptions shall be reviewed during submittal stage.

PART 3 - EXECUTION

3.1 MANUFACTURER'S SERVICES

- A. Furnish the following manufacturer's services for the instrumentation listed below provided during the field testing period:
 - 1. Perform bench and field calibrations as required.
 - 2. Submit for approval installation details for all instruments.
 - 3. Oversee installation. Verify installation of installed instrument. Certify installation and reconfirm the manufacturer's accuracy statement. Apply company certification sticker on instrument.
 - 4. Coordinate and conduct testing, prepare testing sheets, and certify testing.
- B. Manufacturer's services shall be furnished for the following equipment:
 - 1. All level measuring systems, Specification 17106 – Level Measuring Systems.

3.2 INSTALLATION

A. General

1. All instrumentation, including instrumentation furnished under other Divisions, shall be installed under Division 17 and the manufacturers' instructions. All instruments and equipment shall be tagged.
 2. Equipment Locations: The locations of equipment are approximate. The exact locations and routing of wiring and cables shall be governed by structural conditions and physical interferences and by the location of electrical terminations on equipment. All equipment shall be located and installed so that it will be readily accessible for operation and maintenance. Where job conditions require reasonable changes in approximated locations and arrangements, or when the City exercises the right to require changes in location of equipment which do not impact material quantities or cause material rework, make such changes without additional cost to the City. Coordinate proposed equipment and instrument locations in the field with City prior to installing or submitting details.
- B. Instrumentation Tie-Downs: All instruments, control panels, and equipment shall be anchored by methods which comply with seismic requirements applicable to the site, and per approved Shop Drawings.
- C. Ancillary Devices: Provide any additional or different type connections as required by the instruments and specific installation requirements at no additional cost to the City to provide a complete and operational system. All such additions and all such changes, including the proposed method of installation, shall be submitted to the Engineer for approval prior to commencing the work.
- D. Installation Criteria and Validation: All field-mounted components and assemblies shall be installed and connected according to the requirements below:
1. Installation personnel have at least one copy of the approved shop drawings and installation detail.
 2. All mounting stands and bracket materials and workmanship shall comply with requirements of the Contract Documents.
 3. Verify the correctness of each installation, including polarity of electric power and signal connections, and making sure all process connections are free of leaks. Certify in writing that for each loop or system checked out, all discrepancies have been corrected.

3.3 CALIBRATION

- A. General: All instrumentation provided under Division 17 shall be calibrated, and ranges set, according to the manufacturer's recommended procedures to verify operational readiness and ability to meet the indicated functional and tolerance requirements. Work shall be completed during field testing period, prior to 7 day Demonstration Test.
- B. Calibration Points: Each instrument shall be calibrated at 0, 10, 50, 90 and 100 percent of span using test instruments to simulate inputs. The test instruments shall have accuracies traceable to National Institute of Testing Standards.

- C. Field Calibration: Instruments shall be calibrated in the field to insure proper operation in accordance with the instrumentation data sheets.
- D. Calibration Sheets: Calibration sheets to be submitted prior to start-up of any system. Each instrument calibration sheet shall provide the following information and a space for sign-off on individual items and on the completed unit (as applicable):
 - 1. Project name.
 - 2. Tag number.
 - 3. Manufacturer.
 - 4. Model number.
 - 5. Serial number.
 - 6. Calibration range.
 - 7. Calibration data: Input, output, and error at 10 percent, 50 percent, 90 percent, and 100 percent of span.
 - 8. Switch setting, contact action, and deadband for discrete elements.
 - 9. Space for comments. Confirm conduit and cable tags are installed.
 - 10. Space for approval sign-off by Instrumentation Supplier and date.
 - 11. Provide sticker on instrument that it has been calibrated by supplier and ready for service.

3.4 FIELD TESTING

- A. Field testing shall be provided by the Contractor and approved by the City and Engineer. Notify the Engineer of scheduled tests a minimum of 14 calendar days prior to the testing date, for approval. The Field testing shall be witnessed by the City and Engineer. Field testing shall not begin until NETA Field Testing per Division 16 has been completed. Field Testing shall be completed prior to start of 7 day Demonstration Test.
- B. Provide minimum of 21 calendar days advance notice of testing which requires the City's Programmer to be onsite, to the City's Programmer.

3.5 ON-SITE SUPERVISION

- A. Furnish the services of an on-site engineer or technician to supervise and coordinate installation, adjustment, testing, and start-up of the PCIS.

3.6 TRAINING

- A. General: Train the City's personnel on the maintenance, calibration and repair of all instruments provided under this Contract. Also provide training on ATS, Pump Control Panel (manual and automatic modes).
- B. Instructions: The training shall be performed by qualified representatives of the equipment manufacturers and shall be specific to each piece of equipment.

- C. Duration: Each training class shall be given once and shall be a minimum of two hours in duration and shall cover, as a minimum, operational theory, maintenance, troubleshooting/repair, and calibration. Training class shall be provided for each site, on different days, with scheduled dates per City approval.
- D. Schedule: Training shall be performed during the field testing phase of the project. The training sessions shall be scheduled a minimum of two weeks in advance of when the courses are to be initiated. The City and the Engineer will review the course outline for suitability and provide comments that shall be incorporated.
- E. Agenda: The training shall include operation and maintenance procedures, troubleshooting with necessary test equipment, and changing ranges, and calibration for that specific piece of equipment as applicable.
- F. Documentation: Within 10 days after the completion of each session submit the following:
 - 1. A list of all City personnel that attended the session.
 - 2. A copy of the training materials utilized during the lesson with all notes, drawings, and comments.

3.7 ACCEPTANCE

- A. For the purpose of this Section, the following conditions shall be fulfilled before the Work is considered complete and start of 7 day Demonstration Test.
 - 1. All submittals have been completed and approved.
 - 2. The PCIS has been programmed, configured, calibrated, tested and demonstrated.
 - 3. Radio communications from project sites to off-site SCADA system is functional.
 - 4. The training has been performed.
 - 5. All spare parts have been delivered to the City.
 - 6. All punch-list items have been corrected.
 - 7. Revisions to the O&M Manuals that may have resulted from the field tests have been made and reviewed.
 - 8. All as-built and record drawings in both hard copy and electronic format have been submitted.
 - 9. All debris associated with installation of instrumentation has been removed.
 - 10. All instruments, transmitters, and enclosures have been cleaned and are in like-new condition. Cleaning to include vacuuming interior of panels, wipe down of exteriors, and paint touch up as required by the City and Engineer.

END OF SECTION

SECTION 17106
LEVEL MEASURING SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Furnish and install all level measurement systems with associated instrumentation and controls as shown and specified herein, complete and operable, for functions including level measurement and hardwired float back-up system (HBS) in accordance with the requirements of the Contract Documents.
- B. Wet Well Level measuring system include:
 - 1. Hydrostatic level transducer to measure continuous level in wet well to provide automatic pump control based on operator setpoints. Signal shall also provide alarming to SCADA.
- C. Level Float Switches include:
 - 1. Low-Low Level Switch, Low Level Switch, High Level Switch, High-High Level Switch. Float switches will provide alarming and hardwired back up pump control.
- D. The requirements of Section 17100 – Process Control and Instrumentation Systems apply to this section.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. ISA - S 5.1 Instrumentation Symbols and Identification

1.3 CONTRACTOR SUBMITTALS

- A. Shop Drawings: Submit complete shop drawings of all instruments in accordance with Section 17100 – Process Control and Instrumentation Systems.
- B. Submit specific installation details for float switches and level transducer.
- C. Operation and Maintenance Manuals.

1.4 QUALITY ASSURANCE

- A. Inspection and Testing Requirements: After installation, obtain the services of a technical representative to inspect and test all instruments for proper performance and installation. Verify accuracies.

1.5 GUARANTEES, WARRANTIES

- A. After completion, furnish to the City the supplier's written guarantees that the measuring systems will operate to within 2% of actual level. Furnish the manufacturer's warranties as published in its literature, and submit within the O&M Manuals.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All devices specified herein shall conform to the requirements of Section 17100 – Process Control and Instrumentation Systems.
- B. Instrument manufacturers shall provide 2 year warranty. Submit signed warranty.
- C. Instrument Supplier shall provide Instrument Installation Details, start-up, and testing.

- D. All instruments shall have stainless steel nameplates with tag number and description. Provide nameplates for wet well instruments on cables near access hatch.
- E. Instruments in wetwell to be supported via stainless steel wire mesh grips hung off to stainless steel hooks. Once instrument elevation is set, use black nylon cable ties to prevent instrument from slipping off hook.
- F. Provide engraved phenolic tag, 2" black, round tag, with white letters, cable tied on cable near hook so each instrument is identified; "LT", "LSLL", "LSL", "LSH", and "LSHH".

2.2 HYDROSTATIC LEVEL TRANSDUCER

- A. The continuous level transducer shall be of the hydrostatic pressure type, suitable for raw sewage applications. The transmitter shall be comprised of PTFE coated elastomeric diaphragm in durable 316 stainless steel housing with polyurethane cable. Transducer shall be suitable for sewage wet well applications, Class 1, Division 1 hazardous locations. Cable length shall be sufficient from level transducer to Pump Control Panel without splicing, routed through Termination Cabinet. Bid to include minimum of 90 feet cable length, although the Contractor is responsible for actual cable length required as dependent on conduit routing. Provide lightning protection. Provide with aneroid bellows to be mounted within Pump Control Panel.
- B. Provide stainless steel cable hanger for level transducer.
- C. Probe:
 - 1. The probe shall be rated for raw sewage, Class 1 Division 1 environment.
 - 2. Include sacrificial anode.
 - 3. Output: 4-20 mA, loop powered, 0.25% full scale accuracy.
- D. Manufacturers, no equal:
 - 1. Measurement Specialties MEAS KPSI 705S14C4B###.###000.000B0100B with sacrificial anode KPSI #820, where ###.### is max range output dependent on wetwell depth (measured in feet of water). Provide manufacturer cable hanger KPSI #12-90-0931+. Provide aneroid bellows KPSI #815, to be mounted in Pump Control Panel.
 - 2. Blue Ribbon Model BC001 Birdcage Level Transducer. Provide with sacrificial anode, cable hanger, and bellows.

2.3 FLOAT SWITCHES

- A. Float switches shall include mechanical switch encapsulated in waterproof floating ball, supported by flexible cable with weight. Switch shall be single pole double throw with contacts rated 100 VA up to 120VAC. Level switch system shall include stainless steel cable for securing of float switch, with weight on cable. Switches shall be mercury-free.
- B. Switches shall be suitable for sewage wet well applications, Class 1, Division 1 hazardous locations. Switch body shall be Teflon-coated stainless steel housing. Cord with CPE jacket shall include fine strand, #16 AWG conductors plus ground, suitable for heavy flexing service.

- C. Manufacturer cable length shall be provided to route to Termination Cabinet terminal blocks. Bid to include a minimum 60 feet of cable length, although the Contractor is responsible for actual cable length required as dependent on conduit routing.
- D. Refer to Contract Drawings for desired switch configuration.
- E. Float Switches shall be mercury free versions of Flygt ENM-10, or approved equal. Include float switch with weight, with stainless steel wire mesh grip, and sufficient manufacturer cable lengths.

PART 3 - EXECUTION

3.1 GENERAL

- A. Level measuring systems shall be executed according to the requirements of Section 17100 – Process Control and Instrumentation Systems.
- B. Installations shall follow submitted and approved instrument installation details. Add phenolic tag to instrument cable after secured within wet well.
- C. Float switches used as pump shut-offs shall be set to stop pump just above minimum suction levels as determined by pump supplier. Float switch trigger position shall be approved by the Engineer in field. Coordinate settings with City and Engineer.

3.2 FIELD TESTING

- A. Each item shall be subjected to an operating test over the total range of the equipment. All testing shall be witnessed by the Engineer and City. Verify level switch trip setting with the Engineer and City witness.
- B. Refer to Section 17100 – Process Control and Instrumentation Systems for testing requirements.
- C. Confirm instruments have nameplates, and connected conduits and conductors are labeled.
- D. All Field Testing shall be completed prior to 7 day Demonstration Test.

END OF SECTION

SECTION 17200
PUMP CONTROL PANEL

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. The Contractor, through the Instrumentation Supplier, shall provide the design, panel layouts, schematics, interconnects, wiring, procurement, fabrication, programmable logic controller and radio hardware, factory and field testing, start up, and confirmation of operation of the Pump Control Panel.
- B. Instrumentation Supplier will design and provide fabrication of the Pump Control Panel, CP-1; including power devices, instruments, control devices, power supplies and components. Panels shall include manual transfer switch, main breaker, motor starters, programmable logic controller (PLC), radio, control devices, pump monitoring relays, uninterruptable power supply (UPS), wireways, conductors, terminal blocks, nameplates, and all other accessories and appurtenances required for complete and operable Pump Control Panel. Instrumentation Supplier shop shall be UL-508A certified. Pump Control Panel shall have two doors, with internal physical barrier between 480VAC equipment and control equipment.
 - 1. Any deviations from the Contract Drawings or Specifications, including the Bill of Materials, will need to be approved by the City.
 - 2. Provide a detailed list of any anticipated or requested deviations from the Contract Drawings or Specifications when submitting bids, and with each submittal.
- C. The requirements of Section 17100 - Process Control and Instrumentation Systems apply to this Section.
- D. The PLC shall be furnished by the Contractor and programmed by the City's Programmer ArcSine Engineering. The City's Programmer shall also configure the radio and the SCADA Workstation, after receipt of said equipment from the Contractor. Refer to Section 17100 – Process Control and Instrumentation Systems for additional details.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. ISA - S 5.1 Instrumentation Symbols and Identification

1.03 CONTRACTOR SUBMITTALS

- A. Shop Drawings: Submittals shall be furnished in accordance with Section 01330 – Submittal Procedures, Section 16050 – Electrical Work, General, and Section 17100 – Process Control and Information Systems. Shop Drawings to include:
 - 1. Pump Control Panel elevation views: exterior door view with mounted devices, and back panel view with mounted devices. Provide scaled views with dimensions and equipment name call outs and nameplate schedule. Show space for conduit routing thru back of Panel. Show side view.
 - 2. Drawings shall include terminal block numbers, wire numbers, device names, wire size, wire color, and cross reference to Bill of Materials. Refer to Section 17100 for drawing requirements. Drawings to be in PDF and AutoCAD (version per City) formats.
 - 3. Bill of Materials in Excel format, as well as PDF and AutoCAD formats. Bill of Materials to include exact make and model number of all components of Pump Control Panel.

4. Provide catalog cuts of all devices, components, starters, relays, transformers, power supplies, etc. for approval.
 5. Provide hardcopy print of Wet Well Level Indicator digital meter. Level range shall match level transducer. Include configured alarm setpoints that match float switch trip elevations.
- B. Operation and Maintenance Manuals: Provide O&M Manuals per Sections 01782 and 17100. Provide O&M Manuals in both electronic (PDF and AutoCAD drawings) and a hard copy format.
- C. Provide three (3) hard copy versions of O&M Manual in a 3-ring binder with rigid covers not exceeding 3 inches, typical for each site. Utilize tab sheets to organize information. As a minimum, the Pump Control Panel hard copy O&M Manual shall include:
1. Cover Page: Equipment name, equipment tag number, project name, City's name, vendor contact information, manufacturer contact information, and appropriate date.
 2. Table of Contents: General description of information provided within each tab section.
 3. Drawings:
 - a. 11" x 17" size, approved as-built record drawings.
 - b. Include configured settings, setpoints, alarm points, network address, etc. on drawings.
 4. Preventative Maintenance Procedures: Recommended steps and schedules for maintaining equipment.
 5. Parts List: Generic title and identification number of each component part of equipment.
 6. Spare Parts List: Recommended number of parts to be stored at the site and special storage precautions.
 7. Pump Control Panel Factory Acceptance Test and Field Test results.
- D. Electronic version of O&M Manual shall be formatted and include:
1. The O&M text content shall be delivered in PDF format. The PDF content should make proper use of PDF bookmarking tools for Headings and Heading levels, paragraphs, tables, unordered lists (bulleted lists), and numbered lists. All files shall be organized in a manner which directly corresponds to the order and nomenclature for the submittal table of contents, utilizing PDF bookmarking for each section and sub-section of the submittal.
 2. PDF content should not include any unnecessary scripting, images, framesets, decoration, or style.
 3. If portions of the O&M Manual text are only available as photocopy, these materials may be submitted in Searchable Image PDF format. All other materials, derived from digital source materials shall be delivered in PDF. Materials shall not be scanned if available in digital format
 4. All drawings included in the O&M Manuals shall be provided in the following formats: AutoCAD (version per City) and PDF.
 5. Submit one Electronic version of Pump Control Panel O&M Manual on USB thumb drive, typical for each site.

1.04 QUALITY ASSURANCE

- A. Standard of Quality: The Contractor shall provide equipment of the types and sizes specified which has been demonstrated to operate successfully. Provide equipment which is new and of recent proven design.
- B. IEEE - Institute of Electrical and Electronic Engineers.
- C. NEMA – National Electrical Manufacturers’ Association.
- D. UL – Underwriters’ Laboratories.
- E. NFPA – National Fire Protection Association, NEC and NFPA 70E.
- F. Pump Control Panel shall be provided by UL-508A listed shop.

1.05 GUARANTEES, WARRANTIES

- A. After completion, the Contractor shall furnish to the City the supplier’s written guarantees, that the Pump Control Panel will operate within the published accuracies and ranges and meet these Specifications. The Contractor shall also furnish the manufacturer's warranties as published in its literature, and submit within the O&M Manuals.

1.06 PRE-FACTORY ACCEPTANCE TEST

- A. Instrumentation Supplier shall conduct the following tests prior to arrival of the City and Engineer to witness factory testing:
 - 1. Alarm circuits rung out to determine their operability.
 - 2. Electrical circuits checked for continuity and where applicable, operability.
 - 3. Any other test required to place the panel in an operating condition, including all tests that will be performed for the witnessed Factory Acceptance Test.

1.07 FACTORY ACCEPTANCE TEST

- A. The City and Engineer will inspect the fabricated equipment at the factory before shipment to job sites. Provide two weeks prior notice of Factory Acceptance Test (FAT). FAT should be conducted on Tuesday thru Thursdays only, and shall last no more than 6 hours each day.
- B. Inspection of the equipment at the factory by the City and Engineer will be made after the Instrumentation Supplier has performed satisfactory pre-factory acceptance test, checks, adjustments, etc. Provide a copy of approved submittals, shop drawings and test procedures for City and Engineer to review during the FAT.
- C. Witnessed Factory Acceptance Test:
 - 1. The purpose of the testing is to verify compliance with the specifications and correct deficiencies at the Instrumentation Supplier’s facility and not in the field.
 - 2. Instrumentation Supplier will provide staff and equipment as required to fully inspect and test the Pump Control Panel.
 - 3. FAT procedures shall be submitted and approved prior to witnessed FAT. Procedures shall, at a minimum, provide quality assurance, verify approved Schematic Diagrams in rung by rung manner, confirm materials, confirm nameplate inscriptions, confirm wire colors, confirm wire and terminal block labels. Operate the pump starters. Simulate float switches for operation of hardwired back up controls. Simulate PLC outputs.

4. Approval of Pump Control Panel by the City is required prior to authorization to ship.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All equipment specified herein shall conform to the requirements of Section 17100 - Process Control and Instrumentation Systems.
- B. Environmental Suitability: Pump Control Panel shall be suitable for operation in the ambient conditions associated with the locations designated in the Contract Documents. Supplier shall provide forced air intake and exhaust fan with removable filters. The Contractor shall provide power wiring for these devices.
- C. Components shall be UL listed and NEMA rated. IEC rated components are not allowed. Components shall be rated for 40 degree C ambient. Provide panel with barrier to separate 480VAC power circuits from 120V and less controls. Provide standoff plates to bring equipment forward for through door access.
- D. Pump Control Panel shall be provided by UL listed 508A panel shop. Pump Control Panel shall be supplied Tesco Controls, Inc., KBL Associates, and Technical Systems Inc. (TSI), no equal.

2.02 PUMP CONTROL PANEL ENCLOSURE

- A. Pump Control Panel shall be indoor rated NEMA 12, two doors with three-point latches, freestanding, fabricated from 12 gauge steel, ANSI 61. Control Panel to be nominal 90 inches high, maximum 48 inches wide, and maximum 20 inches deep. Door handles to be pad lockable. Provide panel drawing pocket suitable for 11" x 17" drawings. Ship Pump Control Panel with one copy of accepted submittal drawings, modified as required from FAT results, in a sealed plastic bag stored in the panel drawing pocket. Provide with lifting eyes.
- B. Pump Control Panel to include front door mounted control devices and access to handles from other devices that are mounted within panel. Provide pump monitoring relays, supplied by submersible pump supplier, on panel front. Mounting height of door mounted controls shall be maximum 74 inches from bottom of panel to center of device. Pump Control Panel shall be customized to include full sized internal panel that physically isolates the 480VAC equipment from the control equipment; such that if control section door is opened the 480VAC side door to remain closed and there is a physical barrier to isolate if any arc flash occurs within 480VAC side. Provide grommeted openings in barrier to allow for wire passage. It would also be acceptable to provide two enclosures, one for 480VAC equipment and one for controls, bolted together, with same dimensions (90" high x 48" wide x 20" deep).
- C. Pump Control Panel to include back panel. Allow space below back panel for conduits to enter lower back of panel. Allow space to mount level transducer bellows.

- D. Suitably brace panel structure for sufficient strength to support equipment mounted on or within, to withstand handling and shipment, to maintain alignment, to be rigid and freestanding and resist seismic forces.
 - E. Enclosure to be customized Hoffman Products, Gaylord, or approved equal.
- 2.03 FULL VOLTAGE NON-REVERSING STARTERS
- A. Starters shall be NEMA rated, sized per connected motor nameplate, with electronic overloads. Starters and overloads shall be Eaton, or approved equal.
 - B. Provide surge suppressors across coil of contactors.
- 2.04 POWER QUALITY METER
- A. Power Quality Meter (PQM) shall be capable of displaying voltage, current and power as well as energy (real, reactive and apparent energy, total Wh, VAR, VARh), accept 480 VAC line to line voltage monitoring, 60 Hz, 5 amp current transformer inputs, and 120 VAC powered unit. Provide with Modbus TCP communications. Provide with 100:5 current transformers, with accuracy suitable for metering applications. PQM shall mount on Pump Control Panel front door.
 - B. Provide with line side fuses in finger safe fuse holder, three pole, indicating type, Allen-Bradley 1492-FB series or equal.
 - C. PQM shall be Eaton IQ-150-M-6-5-1-2, or approved equal.
- 2.05 POWER FAIL RELAY
- A. Power Fail Relays (PFR) in Pump Power Panel shall detect low voltage, phase loss and reversal. PFR shall be automatic reset. Include base for 8 pin relay.
 - B. Provide with fuses in finger safe fuse holder, three pole, indicating type, Allen-Bradley 1492-FB series or equal.
 - C. PFR shall be TimeMark A258B, or approved equal.
- 2.06 CIRCUIT BREAKERS
- A. Main circuit breaker shall be three pole, 480 VAC, with rating per Contract Drawings, Eaton C Series, F Frame or approved equal.
 - B. Motor circuit protector breakers shall be 480 VAC, with rating per Contract Drawings, Eaton HMCP, or approved equal.
 - C. Single pole and two pole power circuit breakers, 15 amps and greater, 120 or 240 VAC, with rating per Contract Drawings, Eaton C Series, G Frame or approved equal.
 - D. Single pole circuit breakers, less than 15 amps, shall be Allen-Bradley 1489-M series (AC), 1492-D series (DC), or approved equal.
- 2.07 UPS
- A. UPS shall be 120VAC input, 120VAC output, 15 minute minimum run time at connected load, minimum 750VA, APC Smart-UPS SMT Series, or approved

equal. UPS shall include fail to line voltage control. Provide UPS with dry contact smart card for discrete signal for UPS “low battery” and UPS “on battery”.

- B. Provide dedicated, 20 amp, 125 VAC, single receptacle for UPS input power plug.

2.08 INTRINSICALLY SAFE RELAYS AND BARRIER

- A. Intrinsically safe relays for float switches shall be Warrick 27-A-1-D-0, or approved equal.
- B. Intrinsically safe barrier for level transducer shall be Pepperl+Fuchs KFD0-CC-Ex1, or approved equal.
- C. Provide barrier for intrinsically safe wiring, relays and barrier.

2.09 MANUAL TRANSFER SWITCH

- A. Manual transfer switch shall be 100 amp, 3 pole, 480 VAC, rotary style, compact, Eaton R9 series, or approved equal.

2.10 POWER DISTRIBUTION BLOCKS

- A. Power distribution blocks shall be UL 1953 and 508A listed, 480 VAC, enclosed finger safe type, Cooper Bussman Series PDBFS220, or approved equal.

2.11 WET WELL LEVEL INDICATOR DIGITAL METER

- A. Wet well level indicator digital meter shall be accept 4-20 mA signal to display bar graph and digital level, 24 VDC powered. Digital meter shall allow for custom messages and annunciators, four digit readout, USB port configuration port, programmable dynamic backlight color, and two alarm setpoints. KEP APM-PROC APO, or approved equal.
- B. Panel supplier shall configure digital meter.

2.12 DC POWER SUPPLIES

- A. 120 to 24 VDC power supply, with rating per Contract Drawings, shall be Weidmuller, SOLA or approved equal.
- B. 2120 to 12 VDC power supply, with rating per Contract Drawings, shall be Weidmuller, SOLA, or approved equal.

2.13 CONTROL DEVICES

- A. Control devices including pushbuttons, selector switches, pilot lights, shall be NEMA 4X, 30mm, Allen-Bradley 800H, or approved equal. Lights shall be LED, push to test, transformer type.
- B. Control relays shall be pin type, indicating, with number of contacts as required by Contract Drawings or follower relay provided. Include base for relay. Control relays shall be IDEC RR series, or approved equal.
- C. Time delay relays shall be true on type, indicating, timing ranges and units configurable, with number of contacts as required by Contract Drawings or

follower relay provided. Include base for relay. Control relays shall be IDEC GT3A series, or approved equal.

- D. Elapsed time meter shall be non-resettable, 6 digit (including tenth of hour), Cramer #635K, or approved equal.

2.14 TIMER

- A. Provide spring wound mechanical timer for Panel intrusion alarm override. Timer shall be spring wound countdown timer, SPDT, 120VAC, 0-4 hours, commercial grade, with metal cover plate.
- B. Timer shall be Intermatic FF34H, or approved equal.

2.15 ETHERNET SWITCH

- A. Ethernet switch shall be 6 port, 24 VDC, unmanaged, copper, N-Tron 306TX, or approved equal.

2.16 PROGRAMMABLE LOGIC CONTROLLER (PLC)

- A. PLC part numbers, no equal:
 1. 12-Slot Backplane: BMXXBP1200
 2. 120V ac Power Supply: BMXCPS3500
 3. CPU: BMXP341000
 4. Ethernet Module: BMXNOE0100.2
 5. Analog Input Module, 4 Point: BMXAMI0410
 6. Discrete Input Module (for ac inputs), 16 Point: BMXDAI1604
 7. Discrete Output Module, 8 Point: BMXDRA0805.
- B. Provide one spare of each PLC part. This includes one spare: backplane, power supply, CPU, Ethernet Module, Analog Input Module 4 Point, Discrete Input Module 16 point, Discrete Output Module 8 point.

2.17 RADIO AND ANTENNA

- A. Radio and antenna part numbers, no equal (unless stated different below):
 1. Transceiver Radio – GE MDS iNET-II
 2. Yagi Antenna – PCTel BMOY8905 or Telewave ANT930Y10-WR, or equal
 3. Surge Suppressor – PolyPhaser IS-50NX-C2, or equal
 4. Patch Cable from Surge Suppressor to Radio – LMR-240 coax, length as required; N-Type male termination (Qty. 1); TNC male termination (Qty. 1)
 5. Cable from Antenna to Surge Suppressor – LMR-400 coax of appropriate length. N-Type male termination on both ends..

2.18 AUTODIALER

- A. Autodialer shall be Raco Verbatim, with four digital inputs, capable of 12 programmed phone numbers, 120 VAC power, with 20 hours of battery back-up, no equal. Suitable for hardwired telephone line connection.
- B. Panel supplier shall configure autodialer. Coordinate call out phone numbers and recorded message with City.

2.19 MISCELLANEOUS EQUIPMENT

- A. Panel light shall be door switch activated, LED type.
- B. Fan shall be thermostat controlled. Louvers to be with removable and replaceable filters.
- C. Panel convenience receptacle to be Leviton, or approved equal.
- D. Control power transformer shall be industrial type, Square D 9070 series, or approved equal. Provide additional 500 VA to control power transformer sizing for future connections.
- E. Fuses shall be sized as required, 120VAC, Bussman Class GMA or AGC, or approved equal.
- F. Provide ground bus bar.

2.20 TERMINAL BLOCKS

- A. Terminal blocks shall be suitable for specified wire gauge, rated 20 amperes at 600 volts; with marking strip, covers, pressure connectors, and labeled terminals. Provide minimum 25 percent spare terminals. All control terminal blocks shall be of the spring cage-clamp style.
- B. Field terminal blocks shall be disconnecting type.
- C. PLC digital input, contact output, and analog input, terminal blocks shall be fused type.
- D. Terminal blocks shall be Feed-Through (high density is not allowed) Weidmuller, or approved equal.
- E. Provide minimum 3 inches clearance between terminal strips vertical wireways for space for wire labels.

2.21 WIRING

- A. Pump Control Panel wiring shall be MTW or SIS, stranded copper wire, insulated for not less than 600 volts, with a moisture-resistant and flame-retardant covering rated for not less than 90 degrees Celsius except for electronic circuits and special instrument interconnect wiring which shall be in accordance with Manufacturer requirements.
- B. Wire Size:
 - 1. Power distribution wiring on line side of panel fuses minimum 12 AWG.
 - 2. Control circuit wiring shall be 14 AWG.

- 3. Analog circuit wiring minimum 16 AWG twisted and shielded pairs rated not less than 300 volts.
- C. 480 VAC power wiring shall be maintained on left hand side of panel.
- D. DC control circuits (including but not limited to analog circuits) and 120 VAC control circuits shall be separated as much as possible. In areas where this separation is not possible, wires should be routed in such a manner as to minimize induced voltage between circuits, i.e., circuits should not be routed parallel to each other, but should cross perpendicular.
- E. Group cables, and firmly support wiring to the panel.
- F. Individually fuse each control loop or system.
- G. Clearly label and locate fuses or circuit breakers for maintenance.
- H. Pump Control Panel interior wiring insulation color to as noted below, or per City's submittal review comments.

Service	Color
120 VAC Control Power	Black
120 VAC Control Neutral	White
AC Control Circuits, PLC digital inputs, PLC discrete outputs	Red
AC Control Circuits from external source	Yellow
24 VDC Control Circuits	Blue
24 VDC Common	Blue/White Stripe
12 VDC Control Circuits	Pink
12 VDC Common	Pink/White Stripe
Equipment Grounding Conductor	Green

2.22 GROUNDING

- A. Furnish and install equipment grounding conductor in accordance with NEC 250.
- B. Provide power ground lugs.
- C. Provide signal insulated and isolated ground lugs.

2.23 NAMEPLATES

- A. Provide nameplates on all equipment, devices, breakers, timers, receptacles, etc.
- B. Nameplate materials and approximate dimensions with inscription legends are indicated on the Contract Drawings.
- C. Nameplates shall be made of laminated phenolic material, having engraved letters approximately 1/8 inch high minimum, extending through the black face into the white layer. Attach nameplates to panel with stainless steel screws.
- D. Circuit breakers and fuses shall be provided with nameplates showing the designation and identifying the current rating of the breaker or fuse

2.24 SPARE PARTS

- A. Include spares in Pump Control Panel during shipment from factory.
- B. Provide three fuses of each type and size.

- C. Refer to Programmable Logic Controller (PLC) section above for additional spare parts required.

PART 3 - EXECUTION

3.01 CONTROL PANEL WIRING AND TERMINALS

- A. Wires shall be run in plastic wireways on back panel. Where wires cross door hinge, protect in plastic spiral wrap.
- B. Wire Marking: Each signal, control, alarm, and indicating circuit conductor connected to a given electrical point shall be designated by unique numbers which shall be shown on Shop Drawings. These numbers shall be marked on conductors at every terminal.
- C. Circuit breakers and fuses shall be provided with nameplates showing the designation and identifying the current rating of the breaker or fuse.
- D. Terminal Blocks:
 - 1. All power, control and instrument wires entering and leaving panel shall terminate on terminal blocks with wire numbers on terminals and on both ends of the wires.
 - 2. Numbers shall be assigned to all blocks except grounding blocks.
 - 3. Each terminal block shall have a unique identifying alphanumeric designation. Plastic marking strip segments shall be provided to label terminal blocks. Numbers on this marking strip shall be machine printed and 1/8-inch high minimum.
 - 4. Terminal blocks shall be physically separated into groups by the level of signal and voltage served. Power and control wiring above 100 volts shall have a separate group of terminal blocks from terminal blocks for wiring below 100 volts, intermixing of these two types of wiring on the same group of terminal blocks is not allowed.

3.02 FACTORY ACCEPTANCE TESTING

- A. Refer to Section 17100 – Process Control and Instrumentation Systems for testing requirements.
- B. The Contractor shall perform a thorough Factory Acceptance Test, in conjunction with the City and Engineer. The Factory Acceptance Test shall take place within 100 miles of project site. Provide two week notification of when Factory Acceptance Test to occur for approval of test date from the City. Factory Acceptance Testing to be held only after the City has approved the PLC program and the OIP configuration. The Factory Acceptance Test shall include:
 - 1. The contractor shall submit a complete Factory Acceptance Test plan for submittal, review and approval prior to the factory test.
 - 2. Review all hardware, including part numbers, for compliance with approved submittal. Provide check list for all items on Bill of Material listing.

3. Verify nameplates, wire labels, drawings.
 4. Verify operation of all breakers and fuses.
 5. Verify operation of all relays.
 6. Verify operation of all power supplies.
 7. Verify wiring continuity by simulating all PLC inputs and outputs.
 8. Verify digital display data points, alarm setpoints.
 9. Verify manual operation of pumps.
 10. Verify automatic level control of pumps.
 11. Verify hardwired back up control of pumps.
 12. Verify all interlocks, alarms, etc.
 13. Verify operation and communication with Power Quality Meter.
 14. Verify spare parts.
 15. Upon completion of Factory Acceptance Testing, submit a report certifying that the panels are operable and meet the Specifications.
 16. Any drawing changes that were noted in the Factory Acceptance Test shall be as-built and provided to City and Engineer.
- C. Assist with Owner for testing from field devices to SCADA. Allow 8 hours for this test.

3.03 SHIPMENT AND INSTALLATION

- A. Pump Control Panel shall be crated for shipment using a heavy framework and skids. Instruments that are shipped with the panel shall have suitable shipping stops and cushioning material installed to protect parts that could be damaged due to mechanical shock. Each separate panel unit shall be provided with removable lifting lugs to facilitate handling.
- B. Installation of Pump Control Panel shall be per submitted and approved anchoring means.
- C. Exercise care at all times after installation of Pump Control Panel to keep out foreign matter, dust, dirt, debris, or moisture.
- D. Carefully repair any damage to the structure, components or finish to the satisfaction of the Engineer.
- E. Clean Pump Control Panel interior and exterior prior to start-up.

3.04 FIELD TESTING

- A. Refer to Section 17100 – Process Control and Instrumentation Systems for testing requirements.
- B. The Contractor shall perform a thorough Field Test, in conjunction with the City and Engineer. Provide two week notification of when Field Test to occur for approval from City. Field Testing to be held only after the City has installed and

tested the PLC program, radio configuration, and SCADA Workstation configuration. Field Testing shall include:

1. Point-to-point verification of all PLC digital input circuits from field device to PLC terminal. Contractor to manually activate each input device and check for status change at the appropriate input point. Confirm SCADA Workstation monitoring, status, alarming, etc.
2. Point-to-point verification of all PLC digital output circuits from PLC to field device. With all outputs disconnected use forcing to verify that each output is properly addressed and wired. Confirm SCADA Workstation monitoring, status, alarming, etc.
3. Verification of all PLC analog I/O loops, from field device to PLC terminal. Contractor is responsible to calibrate and test these loops. Confirm digital meter tracking. Confirm SCADA Workstation monitoring, status, alarming, etc.
4. Functional testing of hardwired back up float controls.
5. Functional testing of all communication networks.
6. Place systems in AUTO mode and operate under PLC control with the City observing PLC controls. Monitor systems closely while testing each rung of PLC logic. Confirm SCADA Workstation monitoring, status, alarming, etc. This effort is in addition to 8 hours of testing associated with initial field wiring to PLC testing with City.
7. Contractor to provide Final As-builts and Operation and Maintenance Manuals that reflect all changes and revisions made in field.

END OF SECTION

SECTION 17500
PROGRAMMED SYSTEMS

PART 1 -- GENERAL

1.01 WORK INCLUDED

- A. This Section covers the following items:
 - 1. Programmable Logic Controller (PLC) System
 - 2. SCADA Wireless Communication System
 - 3. Coordination with the City on City performed programming

- B. Programming of the PLC and SCADA Workstation will be by the City's Programmer, ArcSine Engineering. The Contractor shall assume responsibility of planning, scheduling, and coordinating all of the work to make the lift station operational, including coordinating the programming work by the City's Programmer and field verification of Pump Control Panel PLC inputs and outputs.

- C. The Contractor shall deliver the PLC, radio, antenna, and SCADA Workstation (Refer to Section 16050 - Electrical Work, General, paragraph 2.3) to ArcSine Engineering within 12 weeks after Notice to Proceed, for programming, configuration and testing. Deliver SCADA Workstation hardware and software to ArcSine Engineering, Attention Ms. Kendra Bradley, City to provide address for delivery. Contractor to request address prior to shipping. ArcSine Engineering shall deliver PLC, radio, and antenna back to Contractor within four weeks of receiving hardware. ArcSine Engineering will deliver and install SCADA Workstation on site when required for field testing SCADA system.

1.02 GENERAL

- A. In addition to requiring a fully documented and tested system at project completion, it is the intent of these requirements to ensure that the Pump Control Panel is complete, documented, and tested prior to shipping systems to the jobsite. The documentation requirements are significant and require planning to ensure that submittals are provided sufficiently in advance of certain activities.

- B. Special Coordination Requirements
 - 1. The Contractor shall fabricate the Pump Control Panel complete.
 - 2. The Contractor shall allow time for the City's Programmer, ArcSine Engineering, to program the PLC. The programming shall take place prior to the witnessed Factory Acceptance Test. The program shall be installed at the Factory Acceptance Test.
 - 3. Factory Acceptance Testing shall be accomplished at a site within 100 miles of the project site. The testing location shall include provisions for electrical power, climate control, discrete signal simulation and monitoring, and analog signal simulation and monitoring. Provisions shall be made for simultaneously testing/monitoring of no fewer

than 32 discrete inputs and 16 discrete outputs, and 4 analog inputs; and the Contractor's test plans shall be structured to fit within the available instrumentation. In the event that the testing location is more than 100 miles from the project site, the Contractor shall include \$1000 in bid to cover City travel expenses.

C. Summary of Responsibilities

1. The Contractor's schedule shall include all activities necessary to meet the requirements of the Contract Documents, including the table of responsibilities and critical milestones listed below. Should the Contractor delay any programmed systems milestone, then all downstream work items and completion dates required of the programmer shall be delayed (i.e. programming durations cannot be reduced to address Contractor schedule slips).
2. The table below is presented as a summary and does not include all Contractor responsibilities. Except for work specifically called out as being by the City, the Contractor shall provide all labor and materials for a complete and operable system. The Contractor shall plan and manage the work for the entire project, regardless of who is performing the work.

Item	Contractor	City's Programmer
Plan and manage the project, including coordination and scheduling.	✓	
Shop drawings, product submittals, fabrication of Pump Control Panel.	✓	
Deliver PLC, radio, antenna, and SCADA Workstation to the City's Programmer facility within 12 weeks after Notice To Proceed	✓	
PLC programming. Radio configuration. SCADA Workstation programming. Provide PLC position assignments to Contractor.		✓
Deliver PLC, radio, and antenna to Contractor's facility within 6 weeks after receiving same.		✓
Preparation of FAT plan.	✓	
Execution of FAT at the Contractor's facility.	✓	✓ (PLC program only)
Packing, loading of Pump Control Panel, and shipping to job site.	✓	
Installing Pump Control Panel in the field. Starting up. Field testing.	✓	Assist as specified with Start up and Testing

Antenna alignment.	✓	
Preparation of Operation and Maintenance (O&M) manuals.	✓	(PLC program inserts only)
Training.	✓	✓

D. Programmed Systems Milestones

1. The Contractor shall allow in the project schedule the following minimum milestones/durations:
 - 2 weeks notification for PLC/OIP programming required at FAT.
 - Submission of FAT plan no fewer than 4 weeks in advance of earlier FAT date, to allow for subsequent revisions prior to the FAT.
 - 1 week for FAT. This interval shall include a minimum of 2 days during the test for the programmer to make corrections and retest for issues which are solely program-related.

E. PLC I/O Listing

1. Prepare a PLC I/O listing. The listing shall identify all inputs and outputs and their associated position in the PLC rack (position assignments will be provide by the City’s programmer). Figure 1 at the end of this Section is a sample listing indicating the information required. In addition to hardcopy submittals, provide an as-built Excel format file at the completion of the project.
2. The final point listing will be used by the City’s programmer to develop the PLC program. The point listing shall be submitted in advance of the programming task, to be shown on the submitted and approved Contractor’s schedule.

**Figure 1
Sample PLC I/O List**

PLC ID	Tag Number	Description	Type	PLC Slot	PLC Input	Notes
	LSLL-054	Wet Well Level Low-Low	DI	1	2	Set at Feet
	LSL-053	Wet Well Level Low-Low	DI	1	3	Set at Feet
	LSH-052	Wet Well Level Low-	DI	1	4	Set at Feet

		Low				
	LSHH-051	Wet Well Level Low-Low	DI	1	5	Set at Feet
	LIT-053	Wet Well Level	AI	4	1	-4.6 to 15.6 Feet.

- END OF SECTION -

SECTION 17600
TESTING PROCEDURES

The Contractor shall submit for approval Testing Procedures in the format provided below. City Programmer, ArcSine Engineering who is responsible for the PLC and SCADA Workstation programming shall provide additional testing steps, at time of submittal review, to confirm field installation is compatible with programmed features. The following Table is the desired format.

Test Setup

(Contractor's procedures shall provide descriptions of how testing will be performed, i.e. source of water, confirmation of wet well levels, confirmation of float switch trip points versus elevation, etc..)

Tools and Instruments Required

(Contractor shall list tools and instruments required.)

City Representative Requirements

(Contractor shall expectations of City Programmer during test. For example City Programmer shall confirm operation of PLC logic via connected laptop, confirm notification at SCADA Workstation, reset alarms at PLC, reset alarms at SCADA Workstation, coordination with City SCADA operator, etc..)

SAMPLE TESTING PROCEDURES

STEP	ACTION	RESULT	CHECK OFF
1	Adjust level in the wet well to 12" depth (-3.6 Feet)	<ul style="list-style-type: none"> # LT-053 outputs 4.8mA # Wet well level -3.6' signal is sent to the PLC and displayed on the Digital Meter # Wet well level of -3.6' is displayed on SCADA Workstation # LSSL-053 is open, ISR-LL and CR-1 are de-energized, LSSL status light on # LSL-052 is open, ISR-L and CR-2 are de-energized, LSL status light on # LALL-053 is received by the PLC, via CR-1, and transmitted to SCADA Workstation # LAL-052 is received by the PLC via CR-2, and transmitted to SCADA Workstation # A STATION ALARM is annunciated on Panel and Workstation 	
2	Adjust level in the wet well to trip LSSL	<ul style="list-style-type: none"> # LT-053 outputs X.x mA # Wet well level -Y.y' signal is sent to the PLC and displayed on the Digital Meter # Wet well level of -Y.y' is displayed on SCADA Workstation # LSSL-053 is closed, ISR-LL and CR-1 are energized, LSSL status light off # LALL-053 is cleared at the PLC, via CR-1, and no transmitted to SCADA Workstation. # STATION ALARM is reset 	
3	Adjust level in the wet well to trip LSL	<ul style="list-style-type: none"> # <i>(Contractor to submit listing of results for approval)</i> 	

4	Adjust level in the wet well to start Lead Pump Start via Level Transducer	# (Contractor to submit listing of results for approval)	
5	Adjust level in the wet well to start Lag Pump Start via Level Transducer, and simulate Lead Pump failure	# (Contractor to submit listing of results for approval)	
6	Adjust level in the wet well to stop Pumps via Level Transducer	# (Contractor to submit listing of results for approval)	
7	Adjust level in the wet well to trip LSH	# (Contractor to submit listing of results for approval)	
8	Adjust level in the wet well to trip LSHH and initiate HBS mode. Test both PLC Fault, and PLC fail to call pumps scenarios.	# (Contractor to submit listing of results for approval)	
9	(City Programmer to provide additional Steps to fully test programmed system and hardwired controls)	# (City Representative to submit listing of results for approval)	

Test Executed By (Contractor): _____ Date: _____

Test Witnessed By (City Programmer): _____

END OF SECTION

SECTION 17924

CONTROL STRATEGIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Scope: This section provides functional descriptions of the modifications associated with City of Petaluma's existing SCADA system and the new PLC and the new SCADA Workstation software program requirements for the Pump Station PLC based control system as indicated on the drawings and as described within. Programming associated with the existing SCADA System, the new PLC and the new SCADA Workstation will be provided by the City's Programmer ArcSine Engineering, outside of this contract.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PREPARATION

- A. SCADA System and PLC Strategies - General
1. The City of Petaluma SCADA system is an existing system that will be modified by the City's Programmer ArcSine Engineering, and create the new program for the new Payran Pump Station PLC.
 2. Payran Lift Station is an existing Pump station that will have a completely new control system. The Contractor shall provide hardware required for manual and automatic controls of the system. The hardware and City provided software will provide the following controls:
 - a. Remote Manual Control of the Pump Station PLC controlled systems from SCADA.
 - b. Remote Automatic control of the Pump Station PLC controlled systems, selectable from either SCADA.
 3. Any communication failures between SCADA and the Payran Lift Station PLC shall be logged as a SCADA Alarm.

3.2 INSTALLATION

- A. Basic Operating Control Strategies - Payran Lift Station
1. General: The following "Payran Lift Station Control Strategy" descriptions define the key features associated with the Payran Lift Station modifications required as part of this project.
 2. Motor: Where the Drawings define that a motor load is controlled by a PLC, all of the status and alarm functions shall be displayed on the SCADA. Both a PLC automatic based control strategy and a manual overall control via the SCADA shall be provided for each motor.
 3. Packaged System: Where the Drawings define that a package system is monitored by the PLC, all of the status, control and alarm functions noted on the Drawings shall be

displayed on SCADA. These package systems include:

- a. Standby Generator
 4. Pump Station Alarms - Each equipment failure, low-low state, low state, high state, high-high state, communication failures, normal power failures, or UPS power failures shall be reportable via the SCADA.
 5. Pump Station Status and Control - All instrumentation analog values, in actual Engineering units shall be accessible from the SCADA.
 6. Instrumentation:
 - a. Where the P&IDs define that an instrumentation device is monitored by a PLC, all status and alarm functions shall be displayed on the SCADA.
 - b. All instrumentation having an analog value shall have a PLC based High-High, High, Low, and Low-Low alarms that can be monitored by the SCADA. Each alarm shall have a PLC- based set point that can be adjusted via the SCADA. Each alarm shall have a means to be enabled or disabled via the SCADA.
- B. Payran Lift Station Control Strategy - Sewage Lift Station, General
1. The Sewage Lift Station will be a duplex Lead/Lag Pump system using two (2) equally sized submersible Pumps.
 2. All Pumps should auto alternate.
 3. The level transmitter shall start and stop the Pumps during normal operations via the local PLC.
 4. The float switches shall operate the Pumps should the level transmitter fail or the local PLC fail. The Pumps will start with the Level Switch High-High and will stop based on the Low-Low Level Switch. Timing Relay which initiates the hard-wire backup system (HBS). Once the HBS is initiate, Lead Pump will operate between float high and low until an Operator resets the Pump controls.
 5. The panel enclosure shall have an entry alarm with spring wound timer and operator reset.
- C. Payran Lift Station Control Strategy SCADA:
1. SCADA Screen - System Overview: Revise the existing SCADA Screens to include the required modifications to the Payran Lift Station PLC.
 2. SCADA Screen - Poll Cycle Trend: Revise the existing SCADA Screen to include the modifications to the Payran Lift Station PLC
 3. SCADA Screen - CommPoll: Revise the existing SCADA Screen to include modifications to the Payran Lift Station PLC
 4. SCADA Screen - Payran Lift Station: Create new SCADA Screens that will be used to control and monitor the various operations associated with the modifications to the Payran Lift Station PLC or monitored processes. The following minimum features shall be provided on the new SCADA Screen:
 - a. Provide a graphical display of the Pump station that also show the piping and process relationships per the Contract Drawing.
 - b. Wet Well and Wet Well Level Instrumentation

- 1) Wet Well Level (LT 053) including Setpoints and Alarms
 - 2) Wet Well Level Switch Alarms - High-High (LSHH-051), High (LSH-052), Low (LSL-053) and Low (LSLL-054)
- c. Sewage Lift Pump Pump 1 Status and Alarms:
- 1) Run Status
 - 2) Overtemp Status
 - 3) Auto Status
 - 4) Seal Fail
 - 5) Fault
- d. Sewage Lift Pump PUMP 2 Status and Alarms:
- 1) Run Status
 - 2) Overtemp Status
 - 3) Auto Status
 - 4) Seal Fail
 - 5) Fault
- e. Automatic Transfer Switch Position - Normal Power Position and Emergency Power Position
- f. Emergency Generator including Run Status and Fail Alarm
5. SCADA Pop- Up Screen - Payran Lift Station Control Folder
- a. Page "A" - Wet Well: This page will provide the Wet Well Level Control Setpoints, status and alarms.
- 1) Wet Well Level Switch Alarms: High-High (LSHH-051) High (LSH-052), Low (LSL- 053), Low-Low (LSLL-054)
 - 2) Wet Well Level Transmitter (LT-053) Setpoints:
 - a) High-High Alarm and Time Delay
 - b) High Level and Time Delay: Start Sewage Pumps
 - c) Level Control and Time Delay: Allow Sewage Lift Pumps to Operate
 - d) Low Alarm and Time Delay: Stop Sewage Pumps
 - e) Low-Low Alarm and Time Delay
- b. Page "B" - Pumps: This page will provide primary control, status, and alarms associated with the Pumps controlled by the local PLC including:
- 1) PUMP 1 and PUMP 2 Control Status: Auto, Local, SCADA Manual Control - On, SCADA Control - Off, Manual, Off
 - 2) PUMP 1 and PUMP 2 Run Status: On, Off
 - 3) PUMP 1 and PUMP 2 Control Functions: Select Remote, Select Local On, Select Local Off, Alarm Reset, Set SCADA Manual Speed, Select, Level Control PIO

Control Tuning Constants

- 4) PUMP 1 and PUMP 2 Control Timer Functions: Backspin Timers, Report Back Timer, Pump Starts Sequence Delay, and Pump Alarm Delay
- 5) PUMP 1 and PUMP 2 Alarm Status
 - a) High Winding Temperature Alarm
 - b) Pump Leak Alarm
 - c) Overload
- c. Page "F" - Misc Alarms: This page will provide control, status and alarms associated with any miscellaneous non- process related Pump station systems.
 - 1) Miscellaneous System Status:
 - a) Automatic Transfer Switch status is part of Storm Drain Pump Station PLC and outside the scope of work.
 - b) Running on Utility Power
 - c) Running on Generator Power
 - 2) Miscellaneous System Alarms:
 - a) Utility Power Failure
 - b) Standby Generator Failure
 - c) Standby Generator Diesel Fuel Tank Low and Standby Generator Diesel Fuel Tank are part of Storm Drain Pump Station PLC and outside the scope of work. Leak
 - d) UPS Failure
 - e) 24 VDC Failure
 - 3) Miscellaneous Setpoints: Alarm Time Delays
 - a) Utility Power Failure
 - b) Standby Generator Failure
 - c) UPS Failure
 - d) 24 VDC Failure
 - e) Panel Intrusion
 - 4) Miscellaneous Override Control:
 - a) Utility Power Failure Alarm Disable/Enable
 - b) Standby Generator Failure Alarm Disable/Enable
 - c) UPS Failure Alarm Disable/Enable
 - d) 24 VDC Failure Alarm Disable/Enable
 - e) Panel Intrusion Alarm Disable/Enable
- f. Page "G" - Pump Control: This page will provide secondary control, status, and alarms associated with the Pumps controlled by the local PLC including:

- 1) Wet Well Level (LIT - 053)
 - a) Wet Well High-High Level
 - b) Wet Well Low-Low Level
- 2) Pump PUMP 1 and PUMP 2 Control Status:
 - a) Pump Sequence Code
 - b) Selected Pump Alternation Scheme
- 3) Pump PUMP 1 and PUMP 2 Control Functions:
 - a) Select Automatic Pump Rotation
 - b) Select Pump 1 Lead/Pump 2 Lag
 - c) Select Pump P 2 Lead/Pump 1 Lag
- 4) Pump PUMP 1 and PUMP 2 Control Setpoints
 - a) Wet Well Level Setpoint - Start Lead Pump Control
 - b) Wet Well Level Setpoint - Desired Level
 - c) Wet Well Level Control - PID Tuning Constants Setpoints
 - d) Wet Well Low Level Setpoint - Stop Lead Pump
- g. Page "H" - Run Times: This page provides operational runtime data regarding the Pump station including:
 - 1) Daily Runtimes: Provide the total running time over a 24 hour period. Automatically resets to 0 at the end of the 24 hour period.
 - a) Generator
 - b) Pump 1
 - c) Pump 2
 - 2) Total Runtimes: Provide a total running time.
 - a) Generator
 - b) Pump 1
 - c) Pump 2
 - 3) Average Runtimes: Provide the average runtime over a 24 hour period, based on the total daily runtime and the total number of starts in the same 24 hour period.
 - a) Generator
 - b) Pump 1
 - c) Pump 2
 - 4) Number of Starts: Provide the number of starts that occur during a 24 hour period
 - a) Generator
 - b) Pump 1

c) Pump 2

D. Payran Lift Station Control Strategy - (SCADA)

1. General: A Local PC will be located in the Control room. The SCADA will be used to control the various Pump station processes that are controlled by the Pump station PLC.
2. SCADA Screen - Payran Lift Station: Create a SCADA Screen that will be used to control and monitor the various operations associated with the Payran Lift Station PLC controlled or monitored processes. The following minimum features shall be provided on the new SCADA Screen:
 - a. Provide a graphical display of the Pump station that also show the piping and process relationships per the Contract Drawing.
 - b. Pump Station Wet Well
 - 1) Wet Well Level including Common Alarm
 - 2) Wet Well Level Float Alarm - High-High Alarm
 - 3) Wet Well Level Float Alarm - High Alarm
 - 4) Wet Well Level Float Alarm - Low Alarm
 - 5) Wet Well Level Float Alarm - Low-Low Alarm
 - c. Pump 1 Status and Alarms:
 - 1) Run Status
 - 2) Stop Status
 - 3) Pump Selector Switch in Remote
 - 4) Pump Selector Switch in Local
 - 5) Common Failure (Overload, overtemp, seal fail)
 - d. Pump PUMP 2 Status and Alarms:
 - 1) Run Status
 - 2) Stop Status
 - 3) Pump Selector Switch in Remote
 - 4) Pump Selector Switch in Local
 - 5) Common Failure (Overload, overtemp, seal fail)
 - e. Emergency Generator including Run Status and Common Alarm
3. SCADA Pop- Up Screen - Payran Lift Station Control Folder
 - a. Page "A" - Pumps: This page will provide primary control, status, and alarms associated with the Pumps controlled by the local PLC including:
 - 1) Pump 1 and Pump 2 Control Status: Remote, Local, SCADA Manual Control - On, SCADA Control - Off, Manual, Off, Lead Pump , Lag Pump
 - 2) PUMP 1 and PUMP 2 Run Status: On, Off

- 3) PUMP 1 and PUMP 2 Control Functions: Select Lead/Lag, Select Remote, Select Local On, Select Local Off, Alarm Reset, Set SCADA Manual Speed
 - 4) PUMP 1 and PUMP 2 Control Timer Functions: Backspin Timers, Report Back Timer, Pump Starts Sequence Delay, and Pump Alarm Delay
 - 5) PUMP 1 and PUMP 2 Alarm Status
 - a) High Winding Temperature Alarm
 - b) Pump Leak Alarm
 - c) Failure
 - d) Failure to Start Pump
 - e) Control Power Fail
- b. Page "B" - Level: This page will provide control, status, and alarms associated with any level instrumentation associated with the Pump station including:
- 1) Wet Well Level
 - 2) Wet Well Level Alarm Status: High-High, High, Low, Low-Low
 - 3) Wet Well Level Float Switch Alarm: High-High
 - 4) Wet Well Level Float Switch Alarm : High
 - 5) Wet Well Level Float Switch Alarm: Low
 - 6) Wet Well Level Float Switch Alarm: Low-Low
 - 7) Wet Well Level Setpoints:
 - a) High-High Alarm and Time Delay
 - b) High Alarm and Time Delay
 - c) Start Lead Pump
 - d) Level Control Setpoint
 - e) Stop Lead Pump
 - f) Low Alarm and Time Delay
 - g) Low-Low Alarm and Time Delay
 - 8) Wet Well Levels Override Control: Alarm Enable/Disable
- c. Page "F" - Misc Alarms: This page will provide control, status and alarms associated with any miscellaneous non- process related Pump station systems.
- 1) Miscellaneous System Status:
 - a) Running on Generator Power
 - 2) Miscellaneous System Alarms:
 - a) Power Failure
 - b) Generator Failure
 - c) UPS Failure

- d) 24 VDC Failure
 - e) Panel Intrusion
- 3) Miscellaneous Setpoints: Alarm Time Delays
- a) Power Failure
 - b) Generator Failure
 - c) UPS Failure
 - d) 24 VDC Failure
 - e) Panel Intrusion
- 4) Miscellaneous Override Control:
- a) Power Failure Alarm Disable/Enable
 - b) Generator Failure Alarm Disable/Enable
 - c) UPS Failure Alarm Disable/Enable
 - d) 24 VDC Failure Alarm Disable/Enable
 - e) Panel Intrusion Alarm Disable/Enable
- d. Page "G" - Pump Control: This page will provide secondary control, status, and alarms associated with the Pumps controlled by the local PLC including:
- 1) Wet Well Level (LIT - 053)
 - a) Wet Well High-High Level
 - b) Wet Well Low-Low Level
 - 2) PUMP 1 and PUMP 2 Control Status:
 - a) Pump Sequence Code
 - b) Selected Pump Alternation Scheme
 - 3) PUMP 1 and PUMP 2 Control Functions:
 - a) Select Automatic Pump Rotation
 - b) Select Pump 1 Lead/Pump 2 Lag
 - c) Select Pump 2 Lead/Pump 1 Lag
 - 4) PUMP 1 and PUMP 2 Control Setpoints
 - a) Wet Well Level Setpoint - Start Lead Pump Control
 - b) Wet Well Level Setpoint - Desired Level
 - c) Wet Well Low Level Setpoint - Stop Lead Pump
- e. Page "H" - Run Times: This page provides operational runtime data regarding the Pump station including:
- 1) Daily Runtimes: Provide the total running time over a 24 hour period. Automatically resets to 0 at the end of the 24 hour period.
 - a) Generator

- b) PUMP 1
 - c) PUMP 2
- 2) Total Runtimes: Provide a total running time.
- a) Generator
 - b) PUMP 1
 - c) PUMP 2
- 3) Average Runtimes: Provide the average runtime over a 24 hour period, based on the total daily runtime and the total number of starts in the same 24 hour period.
- a) Generator
 - b) PUMP 1
 - c) PUMP 2
- 4) Number of Starts: Provide the number of starts that occur during a 24 hour period
- a) Generator
 - b) PUMP 1
 - c) PUMP 2

E. Payran Lift Station Control Strategy - Sewage Wet Well

1. General: The Sewage Wet Well will receive influent flow and when the level in the wet well rises the sewage lift Pumps will be used to discharge flow from the wet well. The wet well is equipped with submersible level transmitter that will serve as the primary means for Pump control. A secondary means for Pump control is provided that allows control of the discharge flow from the Wet Well. In the event that the PLC fails, the level transmitter fails, or if the level in the wet well just continues to rise, a set of level switches will provide backup control of the sewage Pumps and will operate them independently from PLC based control called out as the HBS (hard-wired backup system).
- a. When the Sewage Wet Well Pumps are set for remote, then Sewage Pump 1 and Sewage Pump 2 will operate in a Lead/Lag manner with automatic operation.
- 1) The PLC Alternator can be set to Automatic Alternation, Pump1-Lead/Pump2-Lag, or Pump2-Lead/Pump1-Lag. Pump alternation will occur when the level in the wet well falls to the Pumps Off level setpoint.
- a) Pump Alternation:
- (i) Automatic Alternation: When this control mode is selected, the PLC based controls will automatically alternate between the two Sewage Pumps in a manner to equalize the run times of the two Pumps:
 - (a) Two Pumps set for Automatic Control: When automatic alternation is required, the PLC will determine which Pump had the least run time and designate that Pump the Lead Pump and the second Pump will serve as the Lag Pump.

- (b) One Pump set for Automatic Control: No Alternation required. Pump is the Lead Pump.
 - (ii) Manual Alternation: When this control mode is selected, the operator can designate which Pump:
 - (a) Two Pumps set for Automatic Control: When manual alternation is required, the operator will select which Pump will serve as the Lead Pump and which Pump will serve as the Lag Pump.
 - (iii) If the Lead Pump fails to start and Lag Pump is available, start the Lag Pump.
 - (iv) Provide via SCADA and the SCADA the means to designate "automatic alternation" or "no alternation". If "no alternation" is selected designate which Pump is "Lead" and "Lag"
 - (v) Each Sewage Pump is equipped with a full voltage non-reversing starter.
- 2) Provide via the SCADA the means to designate "automatic alternation" or "no alternation". If "no alternation" is selected designate which Pump is "Lead" and which Pump is "Lag".
 - 3) Pump Automatic (Remote) Control Mode: When the Sewage Pumps are under PLC based control, an operator can set the Pump Automatic Control Mode from the Local Operator Interface. The selected control mode will remain in effect, under an operator elects to choose another Automatic Control Mode. The control modes are as follows:
 - a) Both Pumps set for control: If this control mode is selected, the Pumps will operate in a lead-lag manner based on level setpoints.
 - (i) When the wet well level rises to the Start Lead Pump Level Setpoint, the Lead Pump will run. Pump will stop when level drops below Stop Lead Pump Level Setpoint. The Pump will remain off until the level once again rises to the Start Lead Pump Level Setpoint.
 - (ii) Note that if the Lead Pump runs continuously for a predetermined period of time (operator adjustable from SCADA or the SCADA), then the PLC will automatically shut down the Lead Pump and when the wet well level rises to the Start Lead Pump Level Setpoint, the other Pump will start as the Lead Pump.
- b. The following control set points shall be provided:
 - 1) High-High Level Set Point
 - 2) High Level Set Point
 - 3) Lead Pump Start and Pump Stop Set Points
 - 4) Level Control Set Point
 - 5) One Pump Running,
 - 6) Low Level Set Point
 - 7) Low-Low Level Set Point
 - c. Provide at SCADA and the SCADA elapsed runtime displays for each Pump

- 1) Daily
 - 2) Total
- d. Provide at SCADA and the SCADA, level alarms based on the level switches.
- 1) High-High Float Level Alarm
 - 2) High Float Level Alarm
 - 3) Low Float Level Alarm
 - 4) Low-Low Float Level Alarm
- e. If the Pumps are set to automatic (any one or both), and the level rises to the high level switch, then any Pump set to automatic will be called to run via hardwired controls, see Hard-wire Backup System controls.
2. Sewage Lift Pump No. 1
- a. Typical of Sewage Lift Pump No. 2
 - b. Function: Sewage Lift Pump No. 1 is one of two Pumps that control the flow out of the Sewage Wet Well.
 - c. Local Control: The Pump is equipped with a full voltage non-reversing starter to allow operation of the Pump.
 - d. Selector Switch - Local/Off/Auto: plant personnel can select between Local-Off-Auto-Local Operation via a selector switch.
 - 1) When the selector switch is in the Local Position, the Pump will run.
 - 2) When the selector switch is set in the Off Position, the Pump will not run and is not available for automatic operation or manual operation.
 - 3) When the selector switch is set in the Auto Position, the Pump operation is controlled by the Pump station PLC.
 - e. PLC Based Automatic Control of the Sewage Pump:
 - 1) SCADA Selection: From SCADA Pump station PLC control can be placed in either Manual Control or Automatic Control.
 - 2) Manual Control: When Manual Mode is selected at SCADA the Pump shall be capable of manual control from SCADA. The Pump operations are "Start", "Stop"
 - 3) Automatic Control: When the Automatic Control Mode is selected at SCADA, the Pump operations shall be as described previously within this control strategy above.
 - f. Pump Alarm: Provide four separate alarms for the Pump Failure to Start, Pump Failure, Pump High Temperature, and Pump Moisture. When any of these Pump Alarms are issued to the PLC and a corresponding Pump failure alarm will be generated at the SCADA.
 - 1) Pump Failure to Start:
 - a) If the PLC issues a command to start a Pump and after a time delay, Pump running contact fails to close then a failure to start alarm is issued to the

SCADA.

- b) Remote Reset to Pump , fails to allow Pump start.
- 2) Pump Failure: If the Pump failure alarm is from the Pump Control Panel PLC , then an alarm is sent to SCADA. To reset the alarm, the operator will have to acknowledge the alarm at the Pump Control Panel and then activate the reset at the SCADA.
- 3) Pump High Temperature: A submersible Pump relay mounted in the Pump Control Panel will monitor the Pump Windings. If a High Temperature Alarm occurs, the Pump will be issued a stop command. After three attempts to restart, if the alarm condition doesn't clear, then a Pump Fail to Start Alarm is issued. If the alarm condition doesn't clear, then a Pump Fail is issued and an onsite inspection will be required for correction.
- 4) Pump Moisture: A submersible Pump relay mounted in the Pump Control Panel will monitor the Pump Casing for moisture or leakage. If a Moisture Alarm occurs, the Pump will continue to run, but an alarm will notify if the alarm condition doesn't clear, then a Pump Alarm is issued and an onsite inspection will be required for correction.
- g. Pump Running Status: The PLC shall provide the SCADA with the following information:
 - 1) Daily Runtime for a 24-hour period - Operation
 - 2) Total Runtime - Operation
 - 3) Average Daily Runtime - Operation
- 3. Level Measurement System:
 - a. Submersible Level Transmitter - LIT 053
 - 1) Function: A submersible level transmitter will monitor the level in the Wet Well. This level signal is monitored by the Pump Station PLC. This level signal is used in the automatic PLC based control of the Sewage Lift Pumps, and alarms:
 - a) High-High Level Alarm for Wet Well
 - b) High Level Alarm for Wet Well
 - c) Low Level Alarm for Wet Well.
 - d) Low-Low Level Alarm for Wet Well
 - e) Start and Stop Automatic Control of Lead Pump
 - f) Start and Stop Automatic Control of Lag Pump
 - 2) This level signal will provide the following data and alarms that will be available via the SCADA and SCADA:
 - a) Level
 - b) High-High Level Alarm
 - c) High Level Alarm
 - d) Low Level Alarm
 - e) Low-Low Level Alarm

- b. Float Type Level Switches - LSHH 051, LSH 052, LSL 053, and LSLL 054
 - 1) Function: The level switches provide alarm status regarding the wet well level as well as backup hardwired control of the Sewage Pumps in the event of either a failure of the PLC or the level transducer.

F. Payran Lift Station Hard-wired Backup System (HBS)

- 1. For each Pump, hardwired local manual Pump control is performed using the LOCAL-OFF- AUTO selector switch.
- 2. When selected AUTO, the shall receive and act on RUN commands from the PLC, and also be subject to local hardwired backup Pumping control as described below.
 - a. The hardwired backup system (HBS) shall be invoked and block and lockout PLC control, and remain locked out until RESET, on any of the following conditions:
 - 1) LSHH is reached, the PLC has at least one Pump available to it, and the PLC is not commanding a Pump to RUN.
 - 2) LSLL is reached, and the PLC is commanding the Lead Pump to RUN. The Lead Pump shall stop operation.
 - 3) The PLC 120-volt bus has failed.
 - b. After a time delay (0-120 seconds) of the HBS, a HBS ACTIVE signal shall be sent to the PLC and proceed with Lead Pump constant speed operation:
 - 1) Wet well high float - Lead Pump start
 - 2) Wet well low float - Lead Pump stop
 - 3) HBS Manual Potentiometer is for adjusting the constant speed operation.
 - a) HBS Manual Potentiometer inside the Control Panel and not normally available.
 - 4) Initial time delay setpoint - 20 seconds.

G. Payran Lift Station Control Strategy - Emergency Generator

- 1. General: The Pump station is equipped with a stationary generator. In the event of a utility power outage, the automatic transfer switch will transfer power need to the Standby Generator and start the stationary generator. Most of the alarms are connected to the Storm Drain PLC,; therefore outside the scope of work.

H. Payran Lift Station Control Strategy - Intrusion System.

- 1. General: The building intrusion is part of the Storm Drain Pump Station PLC, and outside the scope of work.

*END OF SECTION**

NP 3127 HT 3~ Adaptive 488

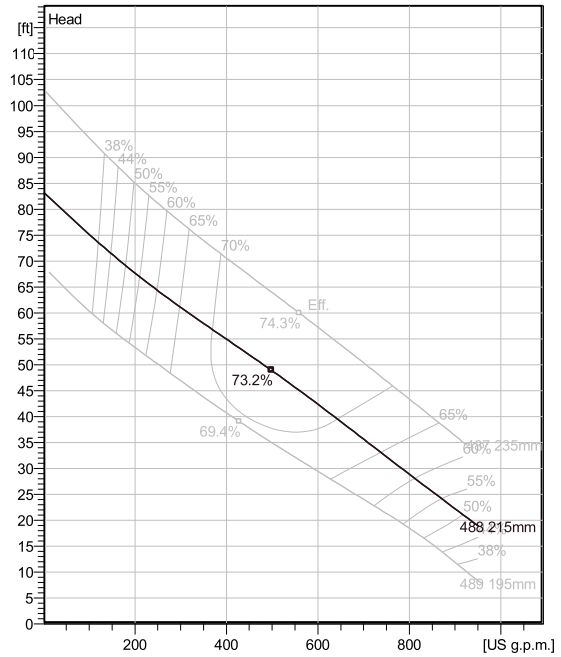
Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.



Technical specification



Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



Configuration

Motor number
N3127.070 21-12-4AL-W 10hp

Installation type
P - Semi permanent, Wet

Impeller diameter
215 mm

Discharge diameter
3 15/16 inch

Pump information

Impeller diameter
215 mm

Discharge diameter
3 15/16 inch

Inlet diameter
100 mm

Maximum operating speed
1720 rpm

Number of blades
2

Materials

Impeller
Hard-Iron™

Stator housing material
Grey cast iron

Project
Block

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Created on 6/18/2019

Last update

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Technical specification



Motor - General

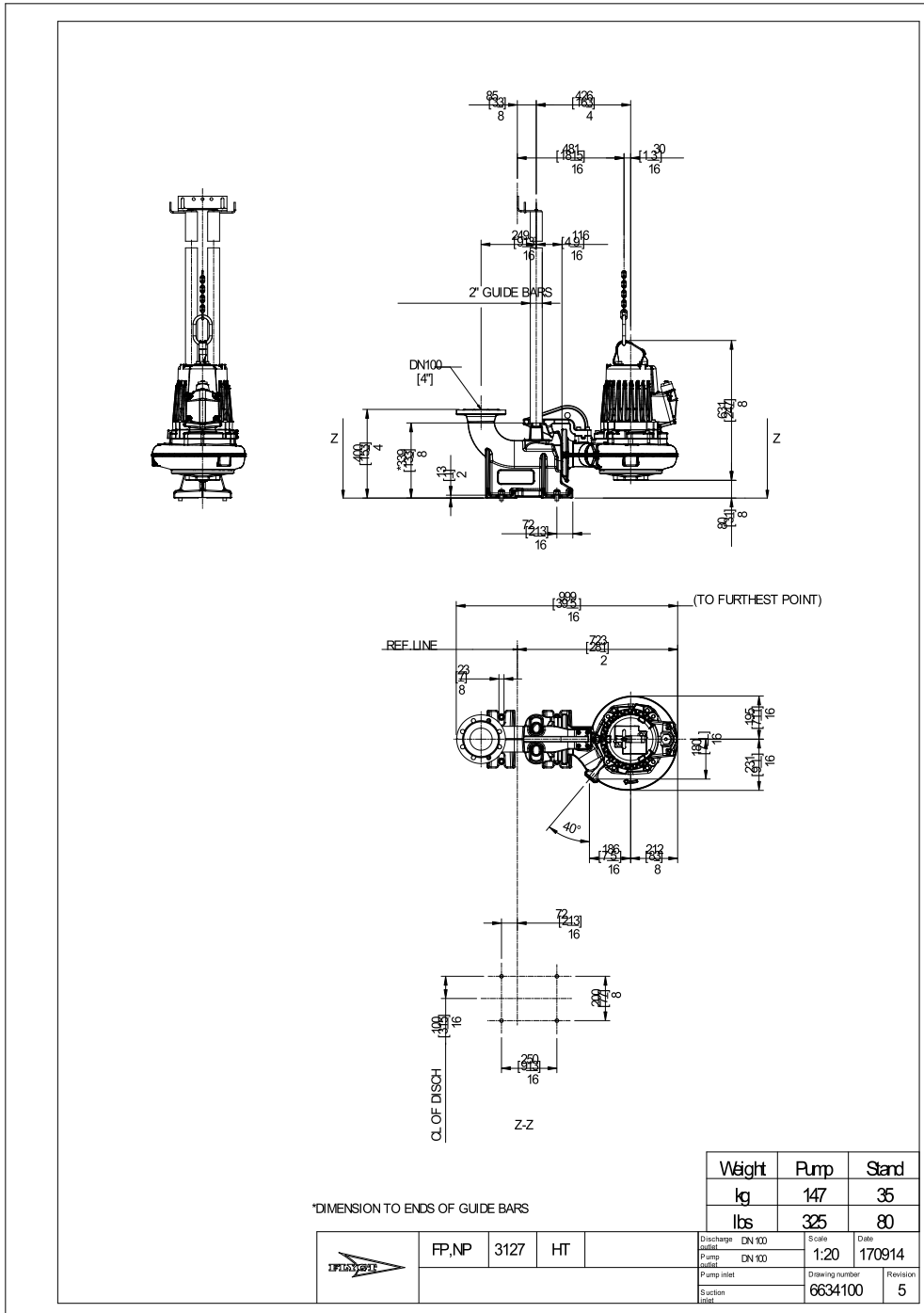
Motor number N3127.070 21-12-4AL-W 10hp	Phases 3~	Rated speed 1720 rpm	Rated power 10 hp
Approval FM	Number of poles 4	Rated current 25 A	Stator variant 12
Frequency 60 Hz	Rated voltage 230 V	Insulation class H	Type of Duty S1

Motor - Technical

Power factor - 1/1 Load 0.88	Motor efficiency - 1/1 Load 84.3 %	Total moment of inertia 1.25 lb ft ²	Starts per hour max. 30
Power factor - 3/4 Load 0.86	Motor efficiency - 3/4 Load 86.5 %	Starting current, direct starting 134 A	
Power factor - 1/2 Load 0.80	Motor efficiency - 1/2 Load 87.0 %	Starting current, star-delta 44.7 A	

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Dimensional drawing



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