

CONTRACT SPECIFICATIONS

For



CITY OF PLACERVILLE

MADRONE AND GIOVANNI SEWER LIFT STATIONS REHABILITATION PROJECT

City Project Number: 40330

City of Placerville
3101 Center Street
Placerville, CA 95667

For use in connection with California Department of Transportation, Standard Specifications **Dated 2015** and Revised Standard Specification Dated February 12, 2016, and Caltrans Standard Plans, City of Placerville Standard Plans, State of California Labor Surcharge and Equipment Rental Rates, and Director of Industrial Relations General Prevailing Wage Rates.

August 25, 2017



Domenichelli & Associates, Inc.
Civil Engineering
1101 Investment Blvd., Suite 115
El Dorado Hills, CA 95762
(916) 933-1997



**CITY OF PLACERVILLE
MADRONE AND GIOVANNI SEWER LIFT STATIONS
REHABILITATION PROJECT**

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**CITY OF PLACERVILLE
MADRONE AND GIOVANNI SEWER LIFT STATIONS
REHABILITATION PROJECT**

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CITY OF PLACERVILLE, CALIFORNIA\
DEVELOPMENT SERVICES DEPARTMENT
ENGINEERING DIVISION

MADRONE AND GIOVANNI SEWER LIFT STATIONS REHABILITATION PROJECT

City Project No. 40330

BIDDING REQUIREMENTS



CITY OF PLACERVILLE, CALIFORNIA\
DEVELOPMENT SERVICES DEPARTMENT
ENGINEERING DIVISION

SECTION 00020
NOTICE TO BIDDERS

NOTICE IS HEREBY GIVEN by the City of Placerville, State of California, that sealed bids for work in accordance with the Project Plans (Plans) and Contract Documents designated:

MADRONE AND GIOVANNI SEWER LIFT STATIONS REHABILITATION PROJECT
PROJECT NO. 40330

below will be received at the 3rd floor front counter at City Hall, 3101 Center Street, Placerville, California 95667, until Thursday, September 21st, 2017 at 2:00 PM, at which time bids will be publicly opened and read aloud at the same address. No bid may be withdrawn after the time established for receiving bids or before the award and execution of the Contract, unless the award is delayed for a period exceeding one hundred twenty (120) calendar days. Bids shall be executed in accordance with the instructions given and forms provided in the bound Contract Documents furnished by the City of Placerville, Engineering Division. All bids must be clearly marked on the envelope:

MADRONE AND GIOVANNI SEWER LIFT STATIONS REHABILITATION PROJECT
PROJECT NO. 40330

COST ESTIMATE (FOR BONDING PURPOSES): For bonding purposes, the anticipated project cost is less than \$800,000.

MANDATORY PRE-BID CONFERENCE: A mandatory pre-bid conference will be held at the Giovanni Lift Station, 2462 Giovanni Dr., Placerville, CA 95667. The conference will be held on September 12th, 2017 at 10:00 A.M. Contractors will be granted access to both sites during the conference. Access outside of the schedule conference will only be allowed if scheduled in advance with City staff.

LOCATION/DESCRIPTION OF THE WORK: The project is located in the Madrone Lane and Giovanni Drive areas in the City of Placerville, El Dorado County. The work to be done is shown on the Plans described in the Specifications and generally consists of, but is not limited to rehabilitation of two sewer lift stations:

- Work on the Lift Stations includes all materials, equipment and labor necessary to complete installation of a new sewer lift station, including new pumps, connection to the existing sewer system, drainage improvements, miscellaneous site improvements, and electrical and instrumentation upgrades.
- Project will require traffic control for equipment access and construction of the project by the Contractor and Subcontractor as shown within the Contract Documents.
- Coordination and compliance is also required by the Contractor with various regulatory agencies including the City of Placerville, County of El Dorado, and State Regional Water Quality Control Board.

COMPLETION OF WORK: All work shall be completed within 90 working days after the date of the written notice to proceed from the City for base bid work. If alternative bid is also selected, all work shall be completed within 140 working days. Work is anticipated to occur during normal working hours from the hours of 8 am to 5 pm, Monday through Friday. No work shall be performed by the Contractor on Saturday or Sunday, or City designated holidays.

OBTAINING OR INSPECTING CONTRACT DOCUMENTS: The Contract Documents and Plans are available on August 25th, 2017 and may be examined at City of Placerville Engineering Division, 3101 Center Street, 3rd Floor, Placerville, CA 95667.

The Contract Documents and Plans may be previewed and downloaded for free from <http://cityofplacerville.org> on the Engineering Division webpage by clicking on the "RFPs, RFQs & Projects Out to Bid" or by visiting

<http://www.publicpurchase.com> and searching RFP # 40330. Access www.publicpurchase.com or contact support at support@publicpurchase.com for assistance with free vendor registration and access to this digital project information.

In order to submit a bid on this project, the Contractor must be added to the plan holders list through Public Purchase. The plan holders list ensures receipt of addenda by email from [publicpurchase.com](http://www.publicpurchase.com). Only bidders on the Public Purchase plan holders list that attended the mandatory pre-bid meeting may submit a bid. Bidder is solely responsible for printing and binding all the bid documents and their appropriate scale from the digital format before submitting the bid.

This is a locally funded project through the City's Measure H and L sales tax; subject to local regulations, City of Placerville code and ordinances, including wage rates, civil rights, etc.

All bidders' questions shall be submitted in writing to the City or via email at the contact information provided below. No verbal responses to any questions concerning the content of the Plans and Contract Documents will be given. All responses will be in the form of written addenda to the Contract Documents and Plans. Inquires or question about alleged patent ambiguity of the plans, specifications, or estimate must be submitted as a bidder inquiry before bid opening. Bid inquiries must be received by 4:00 pm on the fourth (4th) business day before bid opening. After this time, the City will not consider these questions as bid protests.

City of Placerville
Engineering Division
Attn: Rebecca Neves, City Engineer
3101 Center Street
Placerville, CA 95667
Email: rneves@cityofplacerville.org

CONTRACTOR'S LICENSE: In accordance with the Provisions of California Public Contract Code Section 3300, the City of Placerville has determined that the Contractor must possess a valid Class A General Engineering License and all other classes required by the categories and types of work included in this contract at the time of contract bid. 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 bid. The Contractor must possess a Class A license or a combination of Class C licenses that make up a majority of the work.

BUSINESS LICENSE: The Contractor must comply with all of the requirements of the City Business License Ordinance, where applicable, before beginning work and through Contract Acceptance.

GENERAL INFORMATION: Bids must be on unit price basis. The amount of bid for comparison purposes will be the total sum based on unit prices.

PREVAILING WAGE RATES: Pursuant to the Labor Code of the State of California, the Director of Industrial Relations has determined the general prevailing rate of wages and employer payments for health and welfare, vacation, pension, and similar purposes applicable to the work to be done. This rate and scale is available at the DIR website: <http://www.dir.ca.gov/DLSR/PWD> or from the City Clerk's office. The Contractor to whom the contract is awarded, and the subcontractors, must pay not less than these rates for this area to all workers employed in the execution of this contract.

DIR REGISTRATION: Effective March 1, 2015, all contractors and subcontractors shall be registered with DIR pursuant to Labor Code Section 1725.5 to be qualified to bid on this project or to be listed as a subcontractor for this project pursuant to Public Contract Code Section 4104. Bidders will be required to submit proof of registration for themselves and all listed subcontractors prior to award of the contract.

BID BOND: Each bid response shall be accompanied by the bid securities attachments provided at the end of these specifications and include cash, cashier's check, certified check, or Bidder's Bond made payable to the City of Placerville in the amount not less than ten percent (10%) of the total bid amount, such guaranty to be forfeited should the bidder to whom the contract is awarded fail to enter into the contract.

BONDS: The successful bidder will be required to furnish, prior to performance of any work hereunder, a payment bond in the amount equal to one hundred percent (100%) of the contract price, and a faithful performance bond in the amount of equal to one hundred percent (100%) of the contract price. The bonds must be approved by the City. As a condition precedent to the completion of this contract, the contractor shall furnish a Warranty Bond, in a form acceptable to the City in an amount of one hundred percent (100%) of the total contract price plus change orders, to hold good for a period of one year after the completion and acceptance of the work, to protect the City against the results of defective materials, quality of work, and equipment during that time. This bond shall be delivered to the City before the final payment under this contract will be made.

SUBSTITUTE SECURITIES FOR RETENTION MONEYS: In accordance with Part 5 (Section 22300), Division 2 of the Public Contract Code, a contractor may substitute securities for retention moneys withheld by a public agency to ensure performance under this contract. At the request and expense of the contractor, securities equivalent to the amount withheld shall be deposited with the City of Placerville, or with a state or federally chartered bank, as the escrow agent, who shall then pay such moneys to the contractor, and upon satisfactory completion of the contract, the securities shall be returned to the contractor.

SUBMISSION OF BIDS: The City Clerk or her designee will receive sealed bids until 2:00 pm on the bid open date at City Hall, 3rd Floor, 3101 Center Street, Placerville, California. Bids received after this time will not be accepted. Bid proposals shall be sealed in an envelope plainly marked, "BID PROPOSAL FOR MADRONE AND GIOVANNI SEWER LIFT STATIONS REHABILITATION PROJECT, PROJECT NO. 40330". Bids will only be accepted from registered plan holders. Bids not properly marked will be considered nonresponsive. The City will immediately open and publically read the bids at the mentioned location after the specified closing time.

REJECTION AND PROTESTS OF BIDS: The City reserves the right to reject any or all bids or any parts thereof and waive any irregularities or informalities in any bid or in the bidding to the extent permitted by law and to make awards in all or part of the best interest of the City. No bidder may withdraw his bid for a period of one hundred twenty (120) days after the date set for the bid opening. Bid protests must be submitted in writing to the attention of the City Clerk before 4:00 pm of the 5th calendar day following the bid opening.

By: 
Rebecca Neves, P.E. City Engineer
City of Placerville

Date: 8/25/17

SECTION 00100

INSTRUCTIONS TO BIDDERS

1.0 WORK TO BE DONE

It is the intention of the City to construct improvements as shown and set forth in the Contract Documents titled: Madrone and Giovanni Sewer Lift Station Rehabilitation Project, dated August 25, 2017 as prepared by Domenichelli & Associates, Inc. All of the work is particularly set forth in the permits, plans and specifications, and all of said work, together with all other work incidental thereto, and is included. The work includes the furnishing of all labor, materials, taxes, incidentals and equipment necessary for completion of the project. Codes and standards, definition of words and terms, and abbreviations shall be as specified in Contract Specifications.

2.0 EXAMINATION OF CONTRACT DOCUMENTS

Each Bidder shall thoroughly examine and be familiar with those Contract Documents and addenda (if any). The submission of a bid shall constitute an acknowledgment upon which the City may rely that the Bidder has thoroughly examined and is familiar with the Contract Documents. The failure or neglect of a Bidder to receive or examine any of the Contract Documents shall in no way relieve it from any obligation with respect to its bid or to the Contract. No claim for additional compensation will be allowed which is based upon a lack of knowledge of any Contract Documents.

3.0 INSPECTION OF PROJECT SITE AND PRE-BID ACCESS TO THE SITE

Prior to submitting a bid, it will be the sole responsibility of each bidder to conduct any additional examination, investigation, exploration, test, study or other inquiry and to obtain any additional information pertaining to the physical conditions (including surface, subsurface, and underground utilities) at or near the Project site that may affect the cost, progress, or performance of the Project, and that the bidder deems are necessary to prepare its bid for performance of the Project in accordance with the bid package and contract documents. Bidders seeking any such additional examination or other inquiries or information concerning the Project will do so at the bidder's sole expense.

Bidders seeking to conduct any additional examination or other inquiry at the Project site must request site access from the City in writing at least five (5) days in advance. The location of any excavation, boring or other invasive testing will be subject to approval on behalf of the City and any other agencies with jurisdiction over such testing. Bidders may not conduct tests at the Project site prior to obtaining City approval and entering into an executed Indemnity and Release Agreement with the City which will include applicable insurance.

Bidders who intend only to observe site conditions and not conduct such examinations are not required to provide an executed Indemnity and Release Agreement or insurance information.

If, during the course of its site inspection, a Bidder finds conditions which appear to be in conflict with the letter or spirit of the Contract Documents, the Bidder may apply to the

City, in writing, for additional information and explanation at least seven (7) calendar days before the time specified for opening the bids.

Submission of a bid by the bidder shall constitute conclusive evidence that, if awarded the Contract, it has relied upon and is relying on its own examination of (1) the site of the work, (2) access to the site, (3) all other data and matters requisite to the fulfillment of the work and on its own knowledge of existing facilities on and in the vicinity of the site of the work to be constructed under the Contract, (4) the conditions to be encountered, (5) the character, quality and scope of the proposed work, (6) the quality and quantity of the materials to be furnished, and (7) the requirements of the Contract, the plans, the specifications, and other related information made available to Bidders by the City.

The information provided by the City is not intended to be a substitute for, or a supplement to the independent verification by the Bidder to the extent such independent investigation of site conditions is deemed necessary or desirable by the Bidder.

4.0 INTERPRETATION OF CONTRACT DOCUMENTS

No verbal representations or interpretations will be made to any Bidder as to the meaning of the Contract Documents. Requests for an interpretation shall be made in writing and delivered by e-mail or U.S. Mail at least seven (7) business days before the time specified for opening the bids to:

City of Placerville
Engineering Division
Attn: Rebecca Neves, City Engineer
3101 Center Street
Placerville, CA 95667
FAX: 530-642-5568
Email: rneves@cityofplacerville.org

All questions submitted via electronic telecommunication (e-mail) shall be submitted in the time set forth herein. For e-mail to be effective, it shall have a date and time receipt acknowledgment from the City and shall be clearly identified with the following title in the Subject line:

**"Madrone and Giovanni Sewer Lift Station Rehabilitation Project:
Bidder Questions."**

It is the Bidder's sole responsibility to ensure that the e-mail question is *received* by the City in a timely manner. Upon receipt of an e-mail question, the City shall provide acknowledgement of receipt within 1 business day. If the Bidder does not receive an acknowledgement of receipt of an e-mail question from the City within the above referenced timeframe, Bidder shall assume the e-mail transmission was not received by the City, and shall be responsible for resubmitting the same in a timely manner, and if necessary by an alternate allowable method of transmission allowing for confirmation of receipt (e.g., facsimile).

Requests to clarify the source of materials, equipment, suppliers or any other such matter which does not modify, change, increase, or decrease the scope of work requires no action by the City other than a response to the Bidder requesting the clarification.

Requests to clarify possible ambiguous or incomplete statements or designs, or any other such clarification which modifies, changes, increases or decreases the scope of work, requires issuance of an addendum signed by the City and transmitted to all recipients of complete sets of Contract Documents. No other interpretation or information concerning the Contract Documents issued prior to the date specified for opening of bids will be binding.

5.0 POSTPONEMENT OF OPENING

The City reserves the right to postpone the date and time for receiving and/or opening of bids at any time prior to the date and time established in the Notice of Invitation to Bid. Postponement notices may be faxed or emailed and will subsequently be mailed to planholders of record in the form of addenda.

6.0 OPENING OF BIDS

All bids, irrespective of any irregularities or informalities, if received on time, will be opened and publicly read aloud at the time and place set forth in the Notice to Bidders, Bidders, their representatives and other interested persons may be present at the opening and reading of bids.

Any bids received after the time for receiving and opening bids as set forth in the Notice to bidders or as postponed by addenda will not be opened. Any such bids will be returned, unopened, to the Bidder.

The public reading of each bid will include at least the following:

- A. Name and address of bidder.
- B. The total amount of bid.
- C. The nature and amount of the security furnished with the bid.

Provided that if a mandatory pre-bid walk-through is prescribed in Section 00020, **NOTICE TO BIDDERS**, any bid from a Bidder who did not sign the sign-in sheet and attend the meeting and walk-through will be returned to the Bidder unopened.

7.0 PREPARATION OF BID FORMS AND BIDDER'S CHECKLIST

Bids shall be made on the separately bound blank bid forms and must be submitted at the time and place stated in the Notice to Bidders. All blanks in the bid forms must be appropriately filled in, in permanent ink or typed, and all prices must be stated in figures.

All bids must be submitted in sealed envelopes bearing on the outside the name of the Bidder, its address, and the name of the project for which the bid is submitted. It is the sole responsibility of the Bidder to see that its bid is received before the time stipulated in the Notice to Bidders. A Bid will not be accepted after the date and time designated in the Notice to Bidders. Any Bid received after said date and time designated in the Notice to Bidders will be returned to the Bidder unopened. City shall not be responsible for errors or omissions in the bid. Bidders shall write their names on each bid form in the space provided.

The checklist shown below has been prepared and furnished to aid Bidders in including all necessary supporting information with their bid. Bidders' submittals should include, but are not limited to, the following:

ITEM	CHECKED
1. Proposal (Section 00310)	1. _____
2. Acknowledge Addenda (Section 00310)	2. _____
3. List of Subcontractors (Section 00310)	3. _____
4. Public Contract Code Questionnaire and Statements (Section 00310)	4. _____
5. Bidder's proof of DIR Registration	5. _____
6. Non-collusion Declaration (Section 00310)	6. _____
7. Power-of-Authority for Surety's Agent to execute Bidder's Bond	7. _____
8. Authority to sign Proposal ID signature if is by agent other than officer of corporation, partner, or City	8. _____
9. Certification of bidder's experience and qualification [within 3 days following bid]	9. _____

8.0 BIDDER'S SIGNATURE AND AUTHORITY

If the bid is made by an individual; bidder's name, signature, and post office address must be shown. If the bid is made by a firm or partnership; the name and post office address of the firm or partnership, a list of the partners, and the signature of at least one of the general partners must be shown. If the bid is made by a corporation; the bid shall show the name of the state under the laws of which the corporation is chartered, the name and post office address of the corporation, and the title of the person who signs on behalf of the corporation. If the bid is made by a corporation; a certified copy of the bylaws or resolution of the Board of Directors of the corporation shall be furnished, showing the authority of the officer signing the bid, to execute Contract on behalf of the corporation. If the bid is made by a joint venture, the bid shall be signed by a representative of the sponsoring partner of the joint venture. Additionally, the bid shall include a copy of the resolution or agreement empowering the representative to execute the bid and bind the joint venture.

All signatures on the bid shall be in longhand. Signature stamps are unacceptable and shall not be used.

9.0 DESCRIPTION OF BID ITEMS

See Item 2.0 of **Section 01200 - MEASUREMENT AND PAYMENT** for complete description of each Bid Item.

10.0 ERASURES AND CORRECTIONS

The bid submitted must not contain any erasure, interlinear additions, or other corrections unless each such correction is authenticated. Authentication may be made by affixing in the margin, immediately opposite the correction, the signature of the person submitting the bid.

11.0 BID IRREGULARITIES

Changes in or additions to the bid form, recapitulations of the work bid upon, alternative bids, or any other modifications of the bid form which are not specifically called for in Section 00310 may result in rejection of the bid at the City's sole discretion. The City may treat all such bids as not being responsive to the Invitation to Bid. The City, at its' sole discretion may consider no verbal, telephonic or email modification of any bid submitted.

12.0 MODIFICATION OF BID

Upon written request, a bid already received may be modified or withdrawn at any time before the time established for receiving bids. The request must be executed by the Bidder or its authorized representative as described in Paragraph 00100-8.0, **BIDDER'S SIGNATURE AND AUTHORITY**. Modifications shall be made in writing, executed, and submitted in the same form and manner as the original bid. Withdrawal of a bid does not prejudice a bidder's right to submit a new bid within the time designated for the submission of bids. No bid may be withdrawn after the time established for receiving bids except as provided in Paragraph 00100-13.0, **WITHDRAWAL OF BIDS**.

13.0 WITHDRAWAL OF BIDS

In accordance with California Public Contract Code 5103, a bidder may withdraw its bid with the consent of the City. A Bidder desiring to withdraw its bid, after the time of opening the bids, shall give written notice to the City within five (5) days after opening of the Bids (excluding Saturdays, Sundays, or City holidays) of the alleged mistake. The Bidder shall provide documentation in accordance with California Public Contract Code 5103. Bids cannot be changed because of mistake.

14.0 BID PROTEST

The lack of a prompt procedure to resolve disputes regarding the bidding process would impair the City's ability to carry out its purpose of constructing this project in a timely manner. Therefore, to the maximum extent authorized by law and notwithstanding any other procedures specified in documents referenced herein, all disputes and/or protests regarding the bidding process shall be subject to the following procedure. In submitting a bid to the City for this project, the bidder agrees to comply with and to be bound by this procedure.

Any Bid protest must be submitted in writing to the City Engineer of the City of Placerville before 4:00 p.m. on the third (3rd) calendar 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 Contract 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.

15.0 ADDENDA

Addenda issued during the time of bidding shall become a part of the documents furnished bidders for the preparation of bids, shall be covered in the bids, and shall be made a part of the Contract. Each bid shall include specific acknowledgment in the space provided of receipt of all Addenda issued during the bidding period. Failure to so acknowledge may result in the bid being rejected as not responsive. Failure of any bidder to receive such Addenda shall not be grounds for non-compliance with the terms of the instructions.

Addenda will be issued such that they should be received by each recipient of a complete set of Contract Documents no later than three (3) working days prior to the

specified bid date. Addenda withdrawing the request for bids or postponing the bid deadline may be issued anytime prior to the specified bid deadline.

16.0 BID GUARANTY

The bid form shall be accompanied by a bid guaranty bond provided by a surety company authorized to carry on business in the State of California with a minimum "A" rating with Best's Rating Guide for payment to the City in the sum of at least ten percent (10%) of the total amount of the bid price, or, alternatively, by a certified or cashier's check, payable to the City in the sum of at least ten percent (10%) of the total amount of the bid price. The bid guaranty bond shall be provided on the form included in Section 00310, **PROPOSAL**, of this Project Document. The amount payable to the City under the bid guaranty bond, or the certified or cashier's check and the amount thereof, as the case may be, shall be forfeited to the City as liquidated damages in case of a failure or neglect of the bidder to furnish, execute, and deliver to the City the required performance and payment bonds, evidences of insurance; and to enter into, execute, and deliver to the City the Agreement on the form provided herewith, within ~~ten (10)~~ calendar days after receiving written notice from the City that the award has been made and the Agreement is ready for execution.

The bid guarantees of the three lowest Bidders will be retained until the Agreement is signed, evidence of insurance provided, and satisfactory bonds furnished or other disposition made thereof. The bid guarantees will be returned to all but the lowest three responsive bidders upon written request from the Bidder. The bid guarantees from the lowest three bids will be available for return at the time they are considered null and void per terms of the Bid Guaranty Bond.

17.0 QUALIFICATION OF BIDDER

Each bidder shall complete and submit with their bid Section 00420, **CERTIFICATION OF BIDDER'S EXPERIENCE AND QUALIFICATIONS**.

Upon the request of City, any bidder whose bid is under consideration for the award of the Contract shall promptly submit satisfactory evidence showing the bidder's financial resources, its construction experience, and its organization's availability for the performance of the Contract.

The bidder may be required to establish to the satisfaction of the City the reliability and responsibility of the persons or entities proposed to furnish and perform the work described in the Documents.

18.0 LOCAL BUSINESS LICENSE

The Contractor shall have a local business license for the work contemplated before the Contract can be executed. All subcontractors will be required to secure the appropriate local business license before they commence work on the project.

19.0 WORK PERCENTAGES

The Contractor shall perform at least fifty percent (50%) of the Contract Bid Amount. This portion of work shall encompass the performance of work by the Contractor's forces and equipment, the procurement of materials and equipment by the Contractor and field related general conditions required to support and supervise the construction effort. Subcontractors shall not be responsible for the performance of any work or procurement of materials or equipment within the above Contractor's work percentage allotment.

The value of the work subcontracted shall be determined by summing all of the percentages identified for the subcontractors listed in Section 00310. If the sum of such percentages exceeds fifty percent (50%), the City may treat the bid as nonresponsive and reject it on that basis.

20.0 SUBCONTRACTORS

In accordance with California Public Contract Code Section 4100, *et seq.*, "*Subletting and Subcontracting Fair Practices Act*," each general bid shall have listed in Section 00310, **PROPOSAL**, the name, California contractor license number, location of the place of business and the portion of work to be performed by each subcontractor who will perform work or labor or render service to the bidder in or about the construction of the work or improvement, or of any subcontractor licensed by the State of California who, under subcontract to the bidder, will specially fabricate and install a portion of the work or improvement according to detailed drawings contained in the plans and specifications, in an amount in excess of one-half of one percent of the bidder's total bid.

Failure to list subcontractors may render the bid non-responsive and may be grounds for rejection of the bid. Failure to comply with the provisions of the California "Subletting and Subcontracting Fair Practices Act" shall make the Contractor subject to the sanctions as set forth in the Act.

Alternate subcontractors shall not be listed for the same work.

21.0 SOLE-SOURCED ITEMS AND SUBSTITUTIONS DURING BIDDING

Bidders are advised that, in accordance with Public Contract Code Section 3400, the City has made a finding that particular materials, products, things or services are designated by specific brand or trade names in order to match other materials, products, things or services in use or to obtain necessary items available only from one source. By listing a sole-source vendor, City has only identified a particular product the supply of which will conform to the Contract. City does not warrant in any respect the performance of any designated sole-source vendor. City shall not be responsible for, and Contractor shall not be excused for, any failure of a sole-source vendor to supply a conforming product in a timely fashion. Bidders shall refer to individual specification sections for specific requirements.

Contractors, manufacturers or suppliers of materials and equipment may offer an alternative product and request the alternatives to specified products be considered equal unless the City has sole-sourced a product in accordance with Public Contract Code 3400. Inclusion of such alternatives in the bid is the sole responsibility of the Contractor. Inclusion of the proposed alternative should only be considered if it is the

Contractor's sole belief the offered alternative is equal in quality and performance to the specified product. After award of the Contract, such offers of alternative products will be reviewed and processed as a substitution as provided under Section 01330-11.0, **SUBSTITUTES OR "OR EQUAL" ITEMS AND PRODUCT OPTIONS**. If the material, equipment, process or article offered by the contractor is not, in the City's sole opinion, substantially equal or better in respect to that specified, then the contractor shall furnish that material, process or article specified or one that in the City's opinion is substantially equal or better in every respect.

22.0 BIDDERS INTERESTED IN MORE THAN ONE BID

No person, firm, or corporation, under the same or different name, shall make, file, or be interested in more than one bid for the same work unless alternate bids are called for. A person, firm, or corporation may, however, submit sub-proposals or quote prices on materials to more than one bidder.

Pursuant to Public Contract Code Section 7106, Bidders shall execute and furnish with their bids Section 00310, **NON-COLLUSION DECLARATION**. Reasonable grounds to believe that any individual, partnership, corporation, or combination is interested in more than one bid for the proposed work may cause rejection of all bids in which that individual, partnership, corporation, or combination is interested.

23.0 SHEETING, SHORING AND BRACING

Pursuant to the provisions of California Labor Code Section 6707, each bid submitted shall contain, in the bid item indicated, the amount included in its bid for adequate sheeting, shoring, and bracing, or equivalent method, for the protection of life and limb in trenches and open excavation, which shall conform to applicable safety orders. By listing this sum, the Bidder warrants that its action does not convey tort liability to the City, the Design Consultant, the Construction Manager, and their employees, agents, and subconsultants.

24.0 WAGE RATES

Pursuant to provisions of the Labor Code Section 1770, *et seq.*, of the State of California, the Director of the Department of Industrial Relations has ascertained the prevailing rate of per diem wages of the locality in which the Work is to be performed and applicable to the work to be done.

Bidders shall promptly notify the City, in writing, of any and all classifications of labor not listed in the prevailing wage determinations but necessary for the performance of the Work, before bids are submitted.

25.0 OFFER OF ASSIGNMENT OF ANTITRUST ACTIONS

As provided by Section 4552, *et seq.*, of the California Government Code, in submitting a bid to the City, the Bidder offers and agrees that if the bid is accepted, it will 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. Section 15) or under the Cartwright Act (Chapter 2 [commencing with Section 16700] of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, materials, or services by the Bidder

for sale to the City pursuant to the bid. Such assignment shall be made and become effective at the time the City tenders final payment to the Bidder.

26.0 ASSIGNMENT OF CONTRACT

Any attempted assignment by the Contractor of any contract to be entered into hereunder, or any part thereof, or of funds to be received thereunder by the Contractor, is void unless such assignment has prior written approval of City, and the Surety has been given due notice of such assignment in writing and has consented thereto in writing.

27.0 REJECTION OF BIDS

The City reserves the right to reject any and all bids and further reserves the right to reject any bids which are nonresponsive, incomplete, obscure, or irregular; any bids which omit a bid on any one or more items on which the bids are required; any bids in which unit prices are unbalanced in the opinion of the City; any bids accompanied by insufficient or irregular bid guaranty; bids from Bidders who failed to perform properly or complete on time past City projects; and bids from Bidders who fail to meet the experience and qualification requirements set for in the Contract Documents as determined by the City.

The City also reserves the right to waive irregularities in a bid or bidding procedure.

28.0 EVALUATION OF BIDS AND AWARD OF CONTRACT

After the Proposals have been opened and read, they will be checked for accuracy and compliance with the Contract Documents. If a Contract is awarded, it will be to the lowest responsive, responsible, qualified Bidder whose bid complies with the specified requirements, as it may best serve the interests of the City. All bids will be compared on the basis of the Engineer's estimate of the quantities of work to be done. The selection of any or all alternates or bid schedules shall be at the sole discretion of the City. The City reserves the right to reject an unbalanced bid which is a bid having nominal prices for some bid items and enhanced prices for other bid items.

The criteria which will be used to determine the lowest responsive and responsible Bidder are as follows:

Responsive Bidder: Means a Bidder who has submitted a Bid which conforms in all material respects to the Bidding Documents.

Responsible Bidder: Means a Bidder who has the capacity and capability in all respects to perform fully the contract requirements and who has the integrity and reliability to assure good faith performance. Among factors to be considered in determining whether the Bidder meets these standards, are:

- A. Financial, material, equipment, facility, and personnel resources and expertise necessary to meet contractual requirements;
- B. A record of integrity;

C. A record of Successful Project Completions defined as:

1. Completion of project on time and without liquidated damages.
2. Completion of project without excessive defective work issues.
3. Completion of project without excess claims or disputes issues;

D. Qualified legally to contract with the CITY, and;

E. Has not failed to supply any necessary information in connection with the inquiry concerning responsibility.

In the evaluation of any bid, the City shall have the right to consider information provided by sources other than Bidder.

Within sixty (60) days after the time of opening of the bids, the City will act either to accept a bid, to reject all bids or with the consent of the Bidders and their sureties to extend the time in which the City may act. The acceptance of a bid will be evidenced by a Notice of Award of Contract in writing, delivered in person or by mail to the Bidder whose bid is accepted. No other act of City will constitute acceptance of a bid. The Award of Contract shall obligate the Bidder whose bid is accepted to furnish performance and payment bonds and evidences of insurance, and to execute the Agreement in the form set forth in the Contract Documents. The Contract will require the completion of the work according to the Contract Documents.

Only one Contract will be awarded.

29.0 EXECUTION OF CONTRACT

The Agreement shall be executed by the successful bidder and returned, together with the Contract bonds and evidences of insurance, within fifteen (15) calendar days after receiving written Notice of Award of the Contract. Time is of the essence in this regard. After execution by City, one copy of the Agreement shall be returned to Contractor.

The failure to execute the Contract Documents or to furnish the bonds or insurance required by these instructions within fifteen (15) calendar days after receiving written notice of the Award of the Contract constitutes default. In case of default, the City may, at its sole discretion, award the Contract to the next lowest Bidder or may re-advertise the project for new bids. If a more favorable bid is received by re-advertising, the defaulting Bidder shall have no claim against the City for a refund.

If a Bidder to whom an award is made fails or refuses for any reason to execute the Contract or fails to furnish any or all of the required insurance or Contract Bonds in proper form, within the time stated, it is agreed and stipulated between City and the Bidder to whom any award is made that damage has been and will be sustained by the City. It is further agreed by the City and any and all Bidders that it will be impractical and extremely difficult to fully ascertain and determine the actual damage that the City will sustain by such delay. Therefore, the City and all parties who submit a Bid under the Notice Inviting Bids shall be deemed to have jointly studied and attempted to estimate the damages suffered by the City by such delay under these circumstances and agree that the amount of the Bidder's bond or check is agreed to as the liquidated damages payable by such Bidder(s). This Bidder's bond or check will be collected and held by the

City as the sole property of the City for full compensation for the damages suffered by the City as a result of the Bidder's failure to execute the Contract and furnish the Bonds and Insurance as required.

30.0 CONTRACT AND BONDS

The successful Bidder, simultaneously with the execution of the Agreement, will be required to furnish a Payment Bond equal to one hundred percent (100%) of the Contract Price, a Faithful Performance Bond equal to one hundred (100%) of the Contract Price, the **WORKERS' COMPENSATION INSURANCE CERTIFICATE** in Section 00645 and evidences of required insurance. Said insurance and bonds shall be secured from a surety company satisfactory to City with a minimum "A" rating with Best's Rating Guide.

The form of Agreement, as provided in Section 00510, **AGREEMENT** which the successful Bidder as Contractor will be required to execute, and the forms of bonds, which it will be required to furnish, shall be carefully examined by the Bidder. The Faithful Performance Bond is to secure the faithful performance of the Contract, and the Payment Bond is to secure payment for those to whom the Bidder may become legally indebted for labor, materials, tools, equipment, or services of every kind used or employed by the Bidder in performing the work.

31.0 LIST OF RECIPIENTS OF FULL SETS OF CONTRACT DOCUMENTS

Bidders may obtain a current listing of all recipients of complete sets of Contract Documents. This list will also include all plan rooms that were sent Contract Documents. To obtain a list, call the City of Placerville Engineering Division at 530-642-5250 or email your request to rneves@cityofplacerville.org.

*****END OF SECTION*****

**SECTION 00310
PROPOSAL**

**To: CITY OF PLACERVILLE,
COUNTY OF EL DORADO,
STATE OF CALIFORNIA**

For the construction of

**MADRONE AND GIOVANNI SEWER LIFT STATIONS REHABILITATION PROJECT
PROJECT No. 40330**

Bid Opening: September 21, 2017 at 2:00 p.m.

NAME OF BIDDER

BUSINESS POST OFFICE BOX

CITY, STATE, ZIP

BUSINESS STREET ADDRESS
(PLEASE INCLUDE EVEN IF POST OFFICE BOX USED)

CITY, STATE, ZIP

TELEPHONE NO. AREA CODE (.....)

FAX NO. AREA CODE (.....)

The work for which this Proposal is submitted is for the construction in accordance with these Contract Documents (including the payment of not less than the State general prevailing wage rates or Federal minimum wage rates set forth herein), the Project Plans described below, including any addenda thereto, the Contract annexed hereto, and also in accordance with the California Department of Transportation Standard Plans and Standard Specifications, and the Labor Surcharge and Equipment Rental Rates in effect on the date the work is accomplished, and in accordance with the General Prevailing Wage rates. The Project Plans and Contract Documents for the work to be done are entitled:

**MADRONE AND GIOVANNI SEWER LIFT STATIONS REHABILITATION PROJECT
PROJECT No. 40330**

Bids are to be submitted for the entire work, including additive alternates, if any. The amount of the bid for comparison purposes will be the total of all the base and optional (alternative) bid items. The City reserves the right to award the project to include the base bid only, the alternate bid only or the base and alternate bid together.

The Bidder shall set forth for each unit basis item of work a unit price and a total for the item, and for each lump sum item a total for the item, all in clearly legible figures in the respective spaces provided

for this purpose. In the case of unit basis items, the amount set forth under the "Item Total" column shall be the product of the unit price bid and the estimate quantity for the item.

In case of discrepancy between the item price and the total set forth for a unit basis item, the unit price shall prevail, except as provided in (a) or (b), as follows:

- (a) If the amount set forth as a unit price is unreadable or otherwise unclear, or is omitted, or is the same as the amount as the entry in the item total column, then the amount set forth in the total column for the item shall prevail and shall be divided by the estimate quantity for the item and the price thus obtained shall be the unit price.
- (b) (Decimal Errors) If the product of the entered unit price and the estimated quantity is exactly off by a factor of ten, one hundred, etc., or one-tenth, or one-hundredth, etc., from the entered total, the discrepancy will be resolved by using the entered unit price or item total, whichever most closely approximates percentage wise the unit price or item total in the Department's Final Estimate of Cost.

If this Proposal is accepted and the undersigned Bidder shall fail to enter into the Contract and furnish the two bonds in the sums required by the State Contract Act, with surety satisfaction to the City of Placerville within eight days, not including Sundays and legal holidays, after the bidder has received notice from the City of Placerville that the Contract has been awarded, the City of Placerville may, at its option, determine that the Bidder has abandoned the Contract, and thereupon this Proposal and the acceptance thereof shall be null and void and the forfeiture of such security accompanying this Proposal shall operate and the same shall be the property of the City of Placerville.

The undersigned, as Bidder, declares under penalty of perjury under the laws of the State of California that the only persons or parties interested in this Proposal, as principals, are those named herein; that this Proposal is made without collusion with any other person, firm, or corporation; that he has carefully examined the location of the proposed work, the annexed proposed form of Contract, and the Plans therein referred to; and he proposes, and agrees if this Proposal is accepted, that he will contract with the City of Placerville, in the form of the copy of the Contract annexed hereto, to provide all necessary machinery, tools, apparatus, and other means of construction, and to do all the work and furnish all the materials specified in the Contract, in the manner and time therein prescribed, and according to the requirements of the Engineer as therein set forth, and that he will take in full payment therefore the following item prices, to wit:

CONTRACTOR'S BID AND BID PRICE SCHEDULE**MADRONE AND GIOVANNI SEWER LIFT STATIONS REHABILITATION PROJECT
PROJECT No. 40330****BASE BID- GIOVANNI SEWER LIFT STATION REHABILITATION**

ITEM NO.	ITEM DESCRIPTION	UNIT OF MEASURE	ESTIMATED QUANTITY	ITEM UNIT PRICE	TOTAL
1	Mobilization/ Demobilization	LS	1		
2	Site Safety/ Traffic Control Plan	LS	1		
3	Potholing Existing Facilities	LS	1		
4	Clearing and Grubbing	LS	1		
5	Demolition and Abandonment	LS	1		
6	Connection to Existing System	LS	2		
7	New sewer pipeline	LF	250		
8	Sewer wet-well and pump improvements	LS	1		
9	Site drainage improvements	LS	1		
10	Site Electrical	LS	1		
11	Miscellaneous site improvements	LS	1		
12	Supplemental Work	LS	1	\$50,000	\$50,000

ALTERNATIVE BID ITEM – MADRONE SEWER LIFT STATION REHABILITATION

ITEM NO.	ITEM DESCRIPTION	UNIT OF MEASURE	ESTIMATED QUANTITY	ITEM UNIT PRICE	TOTAL
1	Mobilization/ Demobilization	LS	1		
2	Site Safety/ Traffic Control Plan	LS	1		
3	Potholing Existing Facilities	LS	1		
4	Clearing and Grubbing	LS	1		
5	Demolition and Abandonment	LS	1		
6	Connection to Existing System	LS	2		
7	New sewer pipeline	LF	250		
8	Sewer wet-well and pump improvements	LS	1		
9	Site drainage improvements	LS	1		
10	Site Electrical	LS	1		
11	Miscellaneous site improvements	LS	1		
12	Supplemental Work	LS	1		

AMOUNT IN WRITING

AMOUNT IN WRITING

AMOUNT IN WRITING

CONTRACTOR

BIDDER'S PROOF OF DIR REGISTRATION

The Bidder understands that a Bidder will be ineligible for an award of Contract unless the Bidder has furnished the required financial credit rating information required in Item D of Section 00420-CERTIFICATION OF BIDDER'S EXPERIENCE AND QUALIFICATIONS within three (3) business days after the receipt of bids.

SUBCONTRACTORS LISTING

The Bidder shall list the name and address of each subcontractor to whom the Bidder proposes to subcontract portion of the work, as required by the provisions in "Required Listing of Proposed Subcontractors" in Section 2 of the Standard Specifications.

NAME	LOCATION OF BUSINESS	LICENSE No.	DBE (Y/N)	PORTION OR TYPE OF WORK

PUBLIC CONTRACT CODE SECTION 10285.1 STATEMENT

In conformance with Public Contract Code Section 10285.1 (Chapter 376, Stats. 1985), the bidder hereby declares under penalty of perjury under the laws of the State of California that the bidder has ☐ , has not ☐ been convicted within the preceding three years of any offenses referred to in that section, including any charge of fraud, bribery, collusion, conspiracy, or any other act in violation of any state or Federal antitrust law in connection with the bidding upon, award of, or performance of, any public works contract, as defined in Public Contract Code Section 1101, with any public entity, as defined in Public Contract Code Section 1100, including the Regents of the University of California or the Trustees of the California State University. The term "bidder" is understood to include any partner, member, officer, director, responsible managing officer, or responsible managing officer, or responsible managing employee thereof, as referred to in Section 10285.1.

NOTE The bidder must place a check mark after "has" or "has not" in one of the spaces provided. The above Statement is part of the Proposal. Signing this Proposal on the signature portion thereof shall also constitute signature of this Statement. Bidders are cautioned that making a false certification may subject the certifier to criminal prosecution.

PUBLIC CONTRACT CODE SECTION 10162 QUESTIONNAIRE

In conformance with Public Contract Code Section 10162, the Bidder shall complete, under penalty of perjury, the following questionnaire:

Has the bidder, any officer of the bidder, or any employee of the bidder who has a proprietary interest in the bidder, ever been disqualified, removed, or otherwise prevented from bidding on, or completing a federal state, or local government project because of a violation of law or a safety regulation?

Yes ☐ No ☐

If the answer is yes, explain the circumstances in the following space:

PUBLIC CONTRACT CODE SECTION 10232 STATEMENT

In conformance with Public Contract Code Section 10232, the Contractor hereby states, under penalty of perjury, that no more than one final unappealable finding of contempt of court by a federal court has been issued against the Contractor within the immediately preceding two-year period because of the Contractor's failure to comply with an order of a federal court which orders the Contractor to comply with an order of the National Labor Relations Board.

NOTE: The above Statement and Questionnaire are part of the Proposal. Signing this Proposal on the signature portion thereof shall also constitute signature of this Statement and Questionnaire. Bidders are cautioned that making a false certification may subject the certifier to criminal prosecution.

**NONCOLLUSION AFFIDAVIT
(Title 23 United States Code Section 112 and
Public Contract Code Section 7106)**

In conformance with Title 23 United States Code Section 112 and Public Contract Code Section 7106, the bidder declares 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 bidders 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 of 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.

NOTE: The above Noncollusion Affidavit is part of the Proposal. Signing this Proposal on the signature portion thereof shall also constitute signature of this Noncollusion Affidavit. Bidders are cautioned that making a false certification may subject the certifier to criminal prosecution.

BUSINESS AND PROFESSIONS CODE SECTION 7028.15 STATEMENT

In accordance with the Business and Professions Code Section 7028.15, the Contractor hereby states, under penalty of perjury, that he/she is licensed in accordance with an act providing for the State of California registration of Contractors,

License No. _____, Classification(s) _____
Expiration Date _____

By my signature on this proposal, I certify, under penalty of perjury under the laws of the State of California, that the foregoing questionnaire and statements of Public Contract Code Section 10162, 10232, and 10285.1 are true and correct and that the bidder has complied with the requirements of Section 8103 of the Fair Employment and Housing Commission Regulation (Chapter 5, Title 2 of the California Administrative Code). By my signature on this proposal, I further certify, under penalty of perjury under the laws of the State of California and the United States of America, that the Noncollusion Affidavit required by title 23 United States Code Section 11 2 and Public Contract Code Section 7106 are true and correct.

Date: _____

SIGNATURE AND TITLE OF BIDDER _____

NAME OF FIRM _____

Accompanying this proposal is _____
(NOTICE: INSERT THE WORDS "CASH (\$_____)", "CASHIER'S CHECK",
"CERTIFIED CHECK", OR "BIDDER'S BOND", AS THE CASE MAY BE)
in amount equal to at least ten percent (10%) of the total of the bid.

The names of all persons interested in the forgoing proposal as principals are as follows:

IMPORTANT NOTICE: If the Bidder or other interested person is a corporation, state legal name of corporation and place of incorporation, also names of the president, secretary, treasurer, and executive officer thereof; if a partnership, state name of partnership, also names of all individual partners; if Bidder or other interested person is an individual, state first and last names in full.

Licensed in accordance with an act providing for the registration of Contractors,

License No. _____ Classification(s) _____

!(A copy of the afore-referenced license must be attached hereto)!

ADDENDA:

RECEIPT OF COPIES OF THE FOLLOWING ADDENDA(S) IS HEREBY ACKNOWLEDGED.

<u>ADDENDUM NO.</u>	<u>BIDDER'S SIGNATURE</u>	<u>DATE ACKNOWLEDGED</u>

_____	_____	_____
_____	_____	_____
_____	_____	_____

By my signature on this proposal, I certify, under penalty of perjury under the laws of the State of California, that the foregoing questionnaire and statements of Public Contract Code Sections 10162, 10232, and 10285.1 are true and correct and that the Bidder has complied with the requirements of Section 8103 of the Fair Employment and Housing Commission Regulations (Chapter 5, Title 2 of the California Administrative Code). By my signature on this Proposal, I further certify, under penalty of perjury under the laws of the State of California and the United States of America that the Noncollusion Affidavit required by Title 23 United States Code, Section 112 and Public Contract Code Section 7106 are true and correct.

The person or persons executing this Proposal on behalf of a corporation or partnership shall be prepared to demonstrate by resolution, article, or otherwise, that such person is or that such persons are appropriately authorized to act in these regards for such corporation or partnership. Such authority shall be demonstrated to the satisfaction of the City of Placerville.

If the signature is by an agent other than an officer of a corporation or a member of a partnership, a power of attorney authorizing said act by the agent on behalf of his principal shall be submitted with the bid; otherwise, the bid may be disregarded as irregular and unauthorized.

The Bidder's execution on the signature portion of this Proposal shall constitute an endorsement and execution of those affidavits, declarations, and certifications which are part of this Proposal.

Executed this _____ day of _____, 2017

at _____ County, State of _____

SIGN HERE ⇨ _____

Name and Title of Bidder _____

Name of Firm _____

***** END OF PROPOSAL *****

CITY OF PLACERVILLE

BIDDER'S BOND

! (this form MUST be used) !

KNOW ALL PEOPLE BY THESE PRESENTS, THAT WE

_____, as PRINCIPAL, and _____ as Surety are held and firmly bound unto the City of Placerville (Obligee) in the penal sum of TEN (10) PERCENT OF THE AMOUNT OF THE TOTAL BID PRICE of the Principal above named, submitted by said Principal to the Obligee for the work, for the payment of which sum in lawful money of the United States, well and truly to be made to the Obligee, we the Principal and surety bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents. In no case shall the liability of the surety hereunder exceed the sum of

\$ _____

THE CONDITION OF THIS OBLIGATION IS SUCH, THAT:

WHEREAS, the Principal has submitted the above-mentioned bid to the Obligee, as aforesaid, for certain construction specifically described as follows, for which bids are to be opened at Placerville, El Dorado County, California, on September 21, 2017 at 2:00 p.m. for the construction of the

**MADRONE AND GIOVANNI SEWER LIFT STATIONS REHABILITATION PROJECT
PROJECT No. 40330**

NOW, THEREFORE, if the aforesaid Principal is awarded the Contract and, within the time and manner required under the Contract Documents, after the prescribed forms are presented to him for signature, enters into a written contract, in the prescribed form, in accordance with the Bid, and files two bonds with the City of Placerville, one to guarantee faithful performance and the other to guarantee payment for labor and materials, as required by law, then this obligation shall be null and void; otherwise, it shall remain in full force and virtue.

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

IN WITNESS WHEREOF, we have set our hands and seals on this _____ day of _____ 2017.

SIGNATURES

(SEAL) _____ Principal

(SEAL) _____ Surety

Address: _____

(NOTE: Signature of those executing for the Surety shall be properly acknowledged, and accompanied by a Certificate of acknowledgment.)

SECTION 00420
CERTIFICATION OF BIDDER'S EXPERIENCE AND QUALIFICATIONS

PROJECT: Madrone and Giovanni Sewer Lift Stations Rehabilitation Project

PROJECT NO.: 40330

The undersigned Bidder represents that it is competent, knowledgeable and has the special skills to perform the work required for this project. The Bidder further represents that it has evaluated and recognizes the requirements of the Project and the conditions and circumstances under which the Project is to be performed. The Bidder further acknowledges that these inherent conditions existent in the construction of particular facilities may create, during construction, unusual or unsafe conditions hazardous to persons and property. The Bidder expressly acknowledges that it is aware of such risks and that it has the skill and experience to foresee and to adopt protective measures to adequately and safely perform the construction work with respect to such hazards.

A. COMPANY EXPERIENCE – To be filled in and submitted with Bid.

The City will evaluate the Bidder's responsibility based on information included in or otherwise required by this Section 00420 and such additional information as the City may receive. The City will evaluate the Bidder's length and depth of experience with comparable Qualifying Projects. For the City to consider the Bidder properly experienced in work of similar nature to this project, the Bidder must list at least three (3) and not more than six (6) Qualifying Projects, with at least three (3) being public works contracted directly with the public entity as the owner, completed since 2009 meeting all of the following Qualifying Criteria:

1. The Project involved as the primary work installation of sewer pump. The project also included installation of sewer pipelines.
2. The Project required a Class A Contractor license to construct the project as the Prime Contractor.
3. The Prime Contractor self-performed at least fifty percent (50%) of the work on the Project.
4. The Total Project Cost (Prime Contract) exceeded \$200,000.

The City may investigate and independently determine whether the listed Qualifying Projects meet the Qualifying Criteria. The Bidder may include only project(s) for which it was Prime Contractor and projects completed by its Project Manager, named below, working for other companies as Prime Contractor. For projects completed for other companies to be eligible to be Qualifying Projects, the Project Manager shall have worked on them in a capacity similar to that of this Project. The City may accept as a Qualifying Project a Bidder's listed project that does not meet all the Qualifying Criteria, provided that the Bidder adequately demonstrates with its Bid that the Qualifying Projects it has listed are sufficient to give it the necessary experience to be a responsible Bidder. The City's decisions as to responsibility will be based on an overall evaluation of all information received.

If the Bidder is a Joint Venture of two or more companies, each participant in the Joint Venture shall identify at least the minimum number of Qualifying Projects and provide project information for each Joint Venture participant in the format found below.

Qualifying Project # 1 Name: _____

Prime Contractor: _____

Project Manager: _____

Owner: _____

Construction Cost: \$ _____

Construction Time: _____ Calendar Days

Owner's Representative: _____

Owner's Representative Telephone No.: _____

Engineer or On-Site Construction Mgr.: _____

Engineer or On-Site CM's Telephone No.: _____

Date of Substantial Completion: _____

Qualifying Project # 2 Name: _____

Prime Contractor: _____

Project Manager: _____

Owner: _____

Construction Cost: \$ _____

Construction Time: _____ Calendar Days

Owner's Representative: _____

Owner's Representative Telephone No.: _____

Engineer or On-Site Construction Mgr.: _____

Engineer or On-Site CM's Telephone No.: _____

Date of Substantial Completion: _____

Qualifying Project # 3 Name: _____

Prime Contractor: _____

Project Manager: _____

Owner: _____

Construction Cost: \$ _____

Construction Time: _____ Calendar Days

Owner's Representative: _____

Owner's Representative Telephone No.: _____

Engineer or On-Site Construction Mgr.: _____

Engineer or On-Site CM's Telephone No.: _____

Date of Substantial Completion: _____

Qualifying Project # 4 Name: _____

Prime Contractor: _____

Project Manager: _____

Owner: _____

Construction Cost: \$ _____

Construction Time: _____ Calendar Days

Owner's Representative: _____

Owner's Representative Telephone No.: _____

Engineer or On-Site Construction Mgr.: _____

Engineer or On-Site CM's Telephone No.: _____

Date of Substantial Completion: _____

Qualifying Project # 5 Name: _____

Prime Contractor: _____

Project Manager: _____

Owner: _____

Construction Cost: \$ _____

Construction Time: _____ Calendar Days

Owner's Representative: _____

Owner's Representative Telephone No.: _____

Engineer or On-Site Construction Mgr.: _____

Engineer or On-Site CM's Telephone No.: _____

Date of Substantial Completion: _____

Qualifying Project # 6 Name: _____

Prime Contractor: _____

Project Manager: _____

Owner: _____

Construction Cost: \$ _____

Construction Time: _____ Calendar Days

Owner's Representative: _____

Owner's Representative Telephone No.: _____

Engineer or On-Site Construction Mgr.: _____

Engineer or On-Site CM's Telephone No.: _____

Date of Substantial Completion: _____

Total Construction Cost of listed Qualifying Project(s) above: \$ _____

The City further requires disclosure of, and will evaluate, all instances of incomplete projects and pending disputes involving the Bidder. For this purpose, Bidder hereby discloses the following projects for which it was terminated for default at any time in the past five (5) years:

_____.

Bidder shall identify on a separate sheet any claims filed in court or arbitration against Bidder in the past five years which concerned Bidder's work on a construction project. For each claim, if any, the Bidder shall provide the project name, date of the claim, name of the claimant, a brief description of the nature of the claim, the court in which the case was filed and a brief description of the status of the claim (pending or, if resolved, a brief description of the resolution). If there are any pending claims against Bidder that, should Bidder lose the claim(s),

would adversely affect Bidder's financial position or its ability to meet its obligations if awarded the contract for this Project, such claims shall also be disclosed on a separate sheet.

Bidder shall also identify on a separate sheet any claims filed in court or arbitration by Bidder against a project owner in the past five years concerning work on a project or payment for a contract. For each claim, if any, the Bidder shall provide the project name, date of the claim, name of the claimant, a brief description of the nature of the claim, the court in which the case was filed and a brief description of the status of the claim (pending or, if resolved, a brief description of the resolution). If there are any pending claims filed by Bidder against a project owner that, should Bidder lose the claim(s), would adversely affect Bidder's financial position or ability to meet its obligations if awarded the contract for this Project, such claims shall also be disclosed on a separate sheet.

B. PROJECT MANAGER EXPERIENCE- To be filled in and submitted with Bid.

The Bidder shall name below the Project Manager who will be assigned to this project and submit past related project experience of this person which must include successfully completing at least two (2) Qualifying Projects meeting the above Qualifying Criteria where this person held the role of Project Manager. The demonstrated experience of the Project Manager must have been within the last five (5) years. The Project Manager must be assigned to the Project site and be personally present on site full-time during Construction.

Name of Project Manager: _____

Number of Years of Total Construction experience as a Project Manager assigned to the types of projects as defined above: _____ years

Number of Years as a Project Manager for your Company: _____ years

List up to three Qualifying Projects as defined above where the individual named above held the position of Project Manager. At least one (1) of these projects shall have been public works contracted directly with the public entity as the owner.

Qualifying Project # 1 Name: _____

Prime Contractor: _____

Owner: _____

Construction Cost: \$ _____

Construction Time: _____ Calendar Days

Owner's Representative: _____

Owner's Representative Telephone No.: _____

Engineer or On-Site Construction Mgr.: _____

Engineer or On-Site CM's Telephone No.: _____

Date of Substantial Completion: _____

Qualifying Project # 2 Name: _____

Prime Contractor: _____

Owner: _____

Construction Cost: \$ _____

Construction Time: _____ Calendar Days

Owner's Representative: _____

Owner's Representative Telephone No.: _____

Engineer or On-Site Construction Mgr.: _____

Engineer or On-Site CM's Telephone No.: _____

Date of Substantial Completion: _____

Qualifying Project # 3 Name: _____

Prime Contractor: _____

Owner: _____

Construction Cost: \$ _____

Construction Time: _____ Calendar Days

Owner's Representative: _____

Owner's Representative Telephone No.: _____

Engineer or On-Site Construction Mgr.: _____

Engineer or On-Site CM's Telephone No.: _____

Date of Substantial Completion: _____

This form is to be fully completed and submitted by the Bidder with the bid. Bidder is not allowed to provide a substitute form of similar information.

The City will check project references listed to verify information provided along with skills and capacity represented by Bidder. It is very important that the Bidder verify that all contact information is current for each name listed above.

Failure of the Bidder to provide current and valid project contact information and/or failure of the Bidder to meet both the pre-requisite Company and Project Manager experience may be grounds for the City to determine the Bidder as non-responsible and ineligible for contract award.

C. SAFETY QUALIFICATION INFORMATION- To be filled in and submitted with Bid.

Has CAL OSHA cited and assessed penalties against your firm for any “serious,” “willful” or “repeat” violations of its safety or health regulations in the past five years?

NOTE: If you have filed an appeal of a citation, and the Occupational Safety and Health Appeals Board has not yet ruled on your appeal, you need not include information about it.

☐ Yes ☐ No

If “yes,” attached a separate signed page describing the citations, including information about the dates of the citations, the nature of the violation, the project on which the citation(s) was or were issued, the amount of penalty paid, if any. If the citation was appealed to the Occupational Safety and Health Appeals Board and a decision has been issued, state the case number and the date of the decision.

Has the federal Occupational Safety and Health Administration cited and assessed penalties against your firm in the past five years?

NOTE: If you have filed an appeal of a citation and the Appeals Board has not yet ruled on your appeal, or if there is a court appeal pending, you need not include information about the citation.

Experience Modification Rate (EMR).

Enter your firm’s EMR for the last three complete years (this information is provided by your workers’ comp. insurance carrier).

Year	EMR
1-	
2-	
3-	
Three Year Average=	

Are the above rates interstate or intrastate? _____

If intrastate, which state? _____

Is your firm Self-Insured for Workers’ Compensation Insurance in California?

☐ Yes ☐ No

If YES, Self-Insurance No. _____ and attach certification to Bid.

Name of Workers' Comp. Insurance Carrier(s):

Address: _____

Agent Name: _____ Telephone No.: _____

If the Bidder's Three-Year Average EMR is greater than 1.00 (100%), Bidder is required to furnish the following additional information to the EMR information listed above:

Calculate your firm's LWIR for the past three (3) complete years. The lost workday information is listed on your OSHA forms no. 300 and 300A and is available from your workers' comp. insurance carrier.

$$\text{LWIR} = \frac{\text{Total number of lost workday incidents} \times 200,000}{\text{Total employee hours worked}}$$

Year	Lost Workday Incidents	Total Employee Hours Worked	Lost Workday Incident Rate
1-			
2-			
3-			
Totals			

Average Recordable Incident Rate (RIR). Calculate your firm's RIR for the past three (3) complete years. The Incident Rate information is listed on your OSHA forms no. 300 and 300A and is available from your workers' comp. insurance carrier.

$$\text{RIR} = \frac{\text{Total number of recordable incidents} \times 200,000}{\text{Total employee hours worked}}$$

Year	Recordable Incidents	Total Employee Hours Worked	Recordable Incident Rate
1-			
2-			
3-			
Totals			

D. FINANCIAL INFORMATION- To be submitted by the three lowest bidders within three (3) business days following the bid opening date.

Provide evidence that the Bidder has sufficient financial resources to provide all work necessary to complete the project including construction, start-up, and warranty services.

A. Bidder must provide one or more of the following to assist the City in determining the Bidder's financial condition:

1. Copy of a reviewed or audited financial statement with accompanying notes and supplemental information. A financial statement that is not either reviewed or audited is not acceptable.
2. A certified Credit Report, current within 30 days of the date proposals are due. This credit report shall show a Dun & Bradstreet, or equal, credit risk category rating.
3. A letter from the Bidder's bank certifying their opinion of the Bidder's credit risk category rating and Bidder's current available line of credit.

B. Bidder must provide a letter from its Surety or Surety Broker which certifies that Bidder's current bonding capacity is sufficient for this Project based on the Bidder's Bid.

All financial information provided by Bidder that is marked "Confidential" or "Proprietary" shall be handled by the City in accordance with Section 00700.

The undersigned hereby states that all representations regarding the Bidder's Company Experience, Project Manager Experience and Safety Qualification Information are correct and true.

Signed this _____ day of _____, 20____

Bidder's Name

Authorized Signature

Date

Title of Signator

*****END OF SECTION*****



CITY OF PLACERVILLE, CALIFORNIA\
DEVELOPMENT SERVICES DEPARTMENT
ENGINEERING DIVISION

Madrone and Giovanni Sewer Lift Stations Rehabilitation Project

Project No. 40330

CONTRACT FORMS AND REQUIREMENTS

**SECTION 00500
NOTICE OF AWARD**

Date: _____

To: _____
(Name of Bidder)

Address: _____

Project: Madrone and Giovanni Sewer Lift Stations Rehabilitation Project

Project No.: 40330

You are notified that your Bid dated _____ for the above Contract has been considered. You are the Successful Bidder and are awarded a Contract for the construction and completion of the project as described within the contract documents for the City.

Work includes all materials, equipment and labor necessary to complete installation of a new sewer lift station, including new pumps, connection to the existing sewer system, drainage improvements, miscellaneous site improvements, and electrical and instrumentation upgrades. Project will require traffic control for equipment access and construction of the project by the Contractor and Subcontractor as shown within the Contract Documents.

The Contract Price of your Contract is _____ Dollars (\$_____).

Selected Bid/Alternative Bid: _____

Two (2) copies of each of the proposed Section 00510, Agreement for Construction accompany this Notice of Award.

You must comply with the following conditions precedent within fifteen (15) days of the date you receive this Notice of Award.

1. Deliver to City of Placerville – Engineering Division two (2) signed copies of the Agreement, as found in Section 00510, leaving the date blank.
2. Deliver with the Agreement an appropriate Certificate of Authorization.
3. Deliver with the Agreement the Contract Bonds as specified in Section 00100, INSTRUCTIONS TO BIDDERS and Section 00700 City of Placerville Special Provisions.
4. Deliver with the Agreement a signed Certification of Drug-Free Workplace found in Section 00640.

5. Deliver with the Agreement a signed Workers' Compensation Insurance Certificate
6. Deliver with the Agreement all required original Insurance Certificates and endorsements as required in the City of Placerville Special Provisions.
7. Other conditions precedent:

NONE

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award and declare your Bid security forfeited.

Within ten (10) calendar days after you comply with the above conditions, Owner will return to you one fully executed Agreement for your records.

CITY OF PLACERVILLE

By: _____

Its: _____

Copy to Owner's Representative

Construction Manager

Engineer

*****END OF SECTION*****

**SECTION 00510
CONTRACT (AGREEMENT)**

**CITY OF PLACERVILLE
MADRONE AND GIOVANNI SEWER LIFT STATIONS REHABILITATION PROJECT
PROJECT NO.: 40330**

THIS AGREEMENT ("Agreement") approved by the City Council this _____ day of _____, in the year of 2017, made and concluded, in duplicate, between the CITY OF PLACERVILLE, a political subdivision of the State of California, by the Development Services Department hereinafter called "City," and _____ hereinafter called "Contractor."

WITNESSETH:

WHEREAS, City has caused the above-captioned project to be let to formal bidding process, and

WHEREAS, Contractor has duly submitted a bid response for the captioned project upon which City has awarded this contract;

NOW, THEREFORE, the parties hereto have mutually covenanted and agreed, and by these presents do covenant and agree, each with the other, as follows:

Article 1. THE WORK

The Contractor shall complete the Work as specified or indicated under the Bid Schedule(s) of the City's Contract Documents entitled:

**MADRONE AND GIOVANNI SEWER LIFT STATIONS REHABILITATION PROJECT
PROJECT NO.: 40330**

The project is located in the City of Placerville in El Dorado County in the State of California. The Work to be done is shown on the Plans, described in the Special Provisions.

Article 2. CONTRACT DOCUMENTS

The Contract Documents consist of: the Notice to Bidders; the bid forms which include the accepted Proposal, Bid Price Schedule and Total Bid, Subcontractors Listing, Section 10285.1 Statement, Section 10162 Questionnaire, Section 10232 Statement, Noncollusion Affidavit, Bidder's Bond; the Contract which includes this Agreement, Workers Compensation Certificate, Performance Bond, and Payment Bond; the drawings listed and identified as the Project Plans; the Special Provisions and all Addenda incorporated in those documents before their execution, and all Contract Change Orders issued in accordance with the Contract Documents which may be delivered or issued after the Effective Date of this Agreement and are not attached hereto; the prevailing Labor Surcharge And Equipment Rental Rates (when required) as determined by the Department of Industrial Relations to be in effect on the date the Work is accomplished; and all the obligations of City and of Contractor which are fully set forth and described therein; all Contract Documents which are hereby specially referred to and by such reference made a part hereof. All Contract Documents are intended to cooperate so that any work called for in one and not mentioned in the other is to be executed the same as if mentioned in all Contract Documents. Contractor agrees to perform all of its promises, covenants, and conditions set forth in the Contract Documents, and to abide by and perform all terms and conditions set forth therein. In case of conflict between this Agreement and any other contract document, this Agreement shall take precedence.

Article 3. COVENANTS AND CONTRACT PRICE

The City hereby promises and agrees with the said Contractor to employ, and does hereby employ, the said Contractor to provide the material and to do the Work according to the terms and conditions of the Contract Documents herein contained and referred to, for the prices hereinafter set forth, and hereby contracts to pay the same at the time, in the manner and upon the conditions herein set forth; and the said parties for themselves, their heirs, executors, administrators, successors and assigns, do hereby agree to the full performance of the covenants herein contained. The City shall pay the Contractor for the completion of the Work in accordance with the Contract Documents in current funds the Contract Prices named in the Contractor's Bid and Bid Price Schedule, a copy of which is attached hereto as Exhibit "A".

Article 4. COMMENCEMENT AND COMPLETION

The Work to be performed under this Contract shall commence on the date specified in the Notice to Proceed by the City, and the Work shall be fully completed within the time specified in the Notice to Proceed pursuant to the Special Provisions.

The City and the Contractor recognize that time is of the essence of the Agreement and that the City will suffer financial loss if the Work is not completed within the time specified in the Special Provisions annexed hereto, plus any extensions thereof allowed in accordance with the Special Provisions. They also recognize the delays, expense, and difficulties involved with proving in a legal proceeding the actual loss suffered by the City if the Work is not completed on time. Accordingly, instead of requiring any such proof, the City and the Contractor agree that as liquidated damages for delay (but not as a penalty) the Contractor shall pay the City the sum of five thousand dollars (\$5,000.00) for each calendar day the Work remains uncompleted after the time specified herein for the completion of the Work.

Article 5. INDEMNITY

To the fullest extent of the law, the Contractor shall defend, indemnify, and hold the City and its employees harmless against and from any and all claims, suits, losses, damages, and liability for damages, including attorney's fees and other costs of defense brought for or on account of injuries to or death of any person, including but not limited to, workers and the public, or on account of injuries to or death of City employees, or damage to property, or any economic consequential or special damages which are claimed or which shall in any way arise out of or be connected with Contractor's services, operations or performance hereunder, regardless of the existence or degree of fault or negligence on the part of the City, the Contractor, subcontractors or employee of any of these, except the active, or sole, negligence of the City, its officers and employees, where expressly prescribed by statute.

The duty to indemnify and hold harmless the City specifically includes the duties to defend set forth in Section 2778 of the Civil Code. The insurance obligations of the Contractor are separate, independent obligations under the Contract Documents, and the provision of this defense and indemnity are not intended to modify nor should they be construed as modifying or in any way limiting, the insurance obligations set forth in the Contract Documents.

Article 6. GUARANTEES

Contractor shall repair or replace any or all work provided hereunder which is defective due to faulty materials, poor workmanship, or defective equipment at no expense to the City, ordinary wear or tear and unusual abuse or neglect excepted, during the term of the contract and for a period of one year from the date of final accept the Work.

Contractor shall be required to repair or replace any and all adjacent facilities or areas which have been damaged or displaced due to contractor work performed under this Agreement at no expense to the City during the term of this Agreement and for a period of one year from the date of final acceptance of the Work.

The parties agree that this guarantee and the rights and obligations accruing therefrom shall be in addition to, and not by way of limitation in any manner whatsoever to, the rights, obligations, warranties or remedies otherwise provided for by law.

In the event of Contractor's failure to comply with the above mentioned conditions within ten (10) calendar days after being notified in writing by the City, Contractor hereby authorizes City to proceed to have said defects repaired and made good at Contractor's expense, and Contractor will honor and pay all costs and charges therefore upon written demand.

Article 7. DISPUTES RESOLUTION

- a. **CONTINUE WORK DURING DISPUTE:** In the event of any dispute between the City and the Contractor, the Contractor will not stop Work but will prosecute the work diligently to completion in the manner directed by the City, and the dispute shall be resolved by a court of law after completion of the Work. However, all disputes must be submitted by Contractor in accordance with subsequent provisions of this section.
- b. **CITY'S REVIEW OF CLAIM:** The City shall review the facts pertinent to the claim, secure assistance from legal and other advisors, coordinate with the contract administrators, and within the time stipulated in subsection "c" herein, render a written decision on the claim. A copy of the decision shall be furnished to the Contractor by certified mail, return receipt requested, or any other method that provides evidence of receipt. The decision of the City shall be made final and conclusive except as is otherwise provided herein.
- c. **REQUIREMENTS FOR FILING A CLAIM:** For any Claim Subject to this section, the following requirements apply: The claim shall be in writing and include the documents necessary to substantiate the claim. Claims must be filed on or before the date of final payment. Nothing in this subdivision is intended to extend the time limit or supersede notice requirements otherwise provided by contract for the filing of claims.
 1. For claims of less than fifty thousand dollars (\$50,000), the City shall respond in writing to any claim within 45 days of the 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 or claims the City may have against the claimant. If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the City and the claimant. The City's written response to the claim, as further documented, shall be submitted to the claimant within 15 days after the receipt of the further documentation or within a period of time no greater than that taken by the claimant in producing the additional information, whichever is greater.
 2. For claims of fifty thousand dollars (\$50,000) or more, but less than or equal to three hundred seventy-five thousand dollars (\$375,000), the City shall respond in writing to all written claims within 60 days of the 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 or claims the City may have against the claimant. If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the City and the claimant. The City's written response to the claim, as further documented, shall be submitted to the claimant within 30 days after the receipt of the further documentation or within a period of time no greater than that taken by the claimant in producing the additional information, whichever is greater.
 3. If the claimant disputes the City's written response, or the City fails to respond within the time prescribed, the claimant may so notify the City, in writing, either within 15 days of the City's response or within 15 days of the City's failure to respond within the time prescribed, respectively, and demand an informal conference to meet and confer for the

settlement of the issues in dispute. Upon a demand, the City shall schedule a meet and confer conference within 30 days for settlement of the dispute.

4. If following the meet and confer conference the claim or any portion remains in dispute, the claimant 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 the purpose of these provisions, the running of the period of time within which a claim must be filed shall be tolled from the time the claimant submits a 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 conference.
- d. CLAIMS EXEMPT FROM REVIEW: The procedures and remedies provided in this Article 7 do not apply to:
1. Any claims by the City.
 2. Any claims for or respecting personal injury or death or reimbursement or other compensation arising out of or resulting from liability for personal injury or death.
 3. Any claim or dispute relating to stop payment requests or stop notices.
 4. Any claim related to the approval, refusal to approve, or substitution of subcontractors, regardless of tier, and suppliers.
- e. PROCEDURE TO RESOLVE CIVIL CLAIMS: The City and Contractor shall follow procedures established for all civil actions filed to resolve claims pursuant to Section 20104.4 of the Public Contract Code.
- f. PAYMENT OF UNDISPUTED PORTION OF CLAIM: Payment by City of undisputed portion of claim; interest on arbitration award or judgment.
1. City shall pay such portion of a claim which is undisputed except as otherwise provided in the Contract.
 2. In any suit filed under Section 20104.4, of the 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.
- g. SUIT IN EL DORADO COUNTY ONLY: Any litigation arising out of this Contract shall be brought in El Dorado County and the Contractor hereby waives the removal provisions of California Code of Civil Procedure Section 394.

Article 8. ASSIGNMENT OF ANTITRUST ACTIONS

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 the awarding body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, 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.

If an awarding body or public purchasing body receives, either through judgment or settlement, a monetary recovery for a cause of action assigned under this chapter, the assignor shall be entitled to receive reimbursement for actual legal costs incurred and may, upon demand, recover from the public body any portion of the recovery, including treble damages,

attributable to overcharges that were paid by the assignor but were not paid by the public body as part of the bid price, less the expenses incurred in obtaining that portion of the recovery. Upon demand in writing by the assignor, the assignee shall, within one year from such demand, reassign the cause of action assigned under this part if the assignor has been or may have been injured by the violation of law for which the cause of action arose and (a) the assignee has not been injured thereby, or (b) the assignee declines to file a court action for the cause of action."

Article 9. TERMINATION BY OWNER FOR CONVENIENCE

The City reserves the right to terminate the Contract at any time upon determination by the City's Representative that termination of the Contract is in the best interest of the City. City shall issue the Contractor a written notice specifying that the Contract is to be terminated.

Upon receipt of said written notice, Contractor shall stop all work under the Contract except: (1) work specifically directed to be completed prior to termination, (2) work the Inspector deems necessary to secure the project for termination, (3) removal of equipment and plant from the site of the Work, (4) action that is necessary to protect materials from damage, (5) disposal of materials not yet used in the Work as directed by the City, and (6) cleanup of the site.

If the Contract is terminated for the City's convenience as provided herein, all finished or unfinished work and materials previously paid for shall, at the option of City, become its property. Contractor shall be paid an amount which reflects costs incurred for work provided to the date of notification of termination. In addition, Contractor shall be paid the reasonable cost, as solely judged by City, and without profit, for all work performed to secure the project for termination.

Article 10. TERMINATION BY OWNER FOR CAUSE

If the Contractor is adjudged as bankrupt or insolvent, or makes a general assignment for the benefit of its creditors or if a trustee or receiver is appointed for the Contractor or for any of its property, or if Contractor files a petition to take advantage of any debtor's act, or to reorganize under the bankruptcy or applicable laws, or on more than one occasion fails to supply sufficient skilled workmen or suitable material or equipment, or on more than one occasion fails to make prompt payments to subcontractors for labor, materials, or equipment, or disregards the authority of the City's Representative, or the Engineer, if one is appointed, or otherwise violates any provision of the Contract Documents, then the City may, without prejudice to any other right or remedy and after giving the Contractor and its Surety a minimum of 10 days from delivery of a written termination notice, terminate the services of the Contractor and take equipment and machinery thereon owned by the Contractor and finish the Work by whatever method the City may deem expedient. In such case, the Contractor shall not be entitled to receive any further payment until the Work is finished.

Without prejudice to other rights or remedies the City may have, if the Contractor fails to begin delivery of materials and equipment, to commence Work within the time specified, to maintain the rate of delivery of material, to execute the Work in the manner and at such locations as specified, or fails to maintain a work program which will ensure the City's interest, or, if the Contractor is not carrying out the intent of the Contract, an Inspector's written notice may be served upon the Contractor and the Surety on its faithful performance bond demanding satisfactory compliance with the Contract. If the Contractor or its Surety does not comply with such notice within 5 days after receiving it, or after starting to comply, fails to continue, the City may exclude it from the premises and take possession of all material and equipment, and complete the Work by City's own forces, by letting the unfinished Work to another Contractor, or by a combination of such methods.

Where the Contractor's services have been so terminated by the City, said termination shall not affect any right of the City against the Contractor then existing or which may thereafter

accrue. Any retention or payment of monies by the City due the Contractor will not release the Contractor from compliance with the Contract Documents.

If the unpaid balance of the Contract price exceeds the direct and indirect costs of completing the Work, including compensation for additional professional services, such excess shall be paid to the Contractor. If the sums under the Contract are insufficient for completion, the Contractor or Surety shall pay to the City within 5 days after the completion, all costs in excess of the Contract price. In any event, the cost of completing the Work shall be charged against the Contractor and its Surety and may be deducted from any money due or becoming due from the City.

If the Surety assumes any part of the Work, it shall take the Contractor's place in all respect for that part and shall be paid by the City for all Work performed by it in accordance with the Contract. If the Surety assumes the entire Contract, all money due the Contractor at the time of its default shall be payable to the Surety as the work progresses, subject to the terms of this Contract.

The provisions of the section shall be in addition to all other rights and remedies available to the City under law.

If after notice of termination, it is determined for any reason that the Contractor was not in default, the rights and obligations of the parties shall be the same as if the notice of termination had not been issued. The Contract shall be equitably adjusted to compensate for such termination.

Article 11. WORKERS COMPENSATION CERTIFICATION

Contractor warrants and represents that he is aware of the provisions of Section 3700 of the California 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. Pursuant to the provisions of California Civil Code sections 1860, 1861, and prior to commencement of work, the Contractor shall sign and file with the City Project Administrator a certification in the form prescribed in section 1861.

Article 12. WARRANTY

The Contractor warrants to the City that materials and equipment furnished for the Work will be good quality and new, unless otherwise required or permitted under the Contract Documents, that the Work will be free from defects or flaws and is of the highest quality of workmanship and that the Work will conform with the requirements herein. Work not conforming to these requirements, including substitutions not properly approved and authorized, shall be considered defective.

Article 13. RETAINAGE AND FINAL PAYMENT

The retention from payment is set forth in Section 8 "Measurement and Payment" of the Standard of the Special Provisions. The Contractor may elect to receive 100 percent of payments due as set forth in the Contract Documents, without retention, by depositing securities of equivalent value with the City, in accordance with, and as set forth in Section 22300 of the Public Contract Code.

Final Payment to the Contractor in accordance with the final estimate is contingent upon the Contractor furnishing the City with a signed written release of all claims against the City arising by virtue of the Contract. The Contractor, from the operation of the release, may specifically exclude disputed Contract claims in stated amounts. The release shall be in substantially the following form:

WAIVER AND RELEASE UPON FINAL PAYMENT

The undersigned has been paid in full by the City for all labor, services, equipment, and material furnished to the City on the _____ (name of Project) located at _____ and does hereby waive and release the City, its officers, agents, and employees from all claims and liability to the Contractor arising out of, or in any way connected with, the Contract, except for the disputed contract claims specified below:

Notice of Disputed Claim and Amount

\$ _____

Date _____

Name, Title

Name of Contractor

Article 14. AUTHORIZED SIGNATURES

The parties hereto represent that the undersigned individuals executing this Agreement on behalf of their respective parties are fully authorized to do so by law or other appropriate instrument and to bind upon said parties the obligations set forth herein.

IN WITNESS WHEREOF, the said Department of Public Works of the City of Placerville, State of California, has caused this Agreement to be executed by the City Council of the City of Placerville, in its behalf, and the said Contractor has signed this Agreement the day and year written below.

CITY OF PLACERVILLE

Dated _____

City Manager, City of Placerville

CONTRACTOR

Dated _____

Name of Company

By _____
Authorized Representative

License No. Federal Employer Identification No.

NOTE: If Contractor is a corporation, the legal name of the corporations shall be set forth above together with the signature of the officer or officers authorized to sign contracts on behalf of the corporation; if Contractor is a co-partnership, the true name of the firm shall be set forth above together with the signature of the partner or partners authorized to sign contracts in behalf of the co-partnership; and if Contractor is an individual, his/her signature shall be placed above. Contractor executing this document on behalf of a corporation or partnership shall be prepared to demonstrate by resolution, article, or otherwise that they are appropriately

authorized to act in these regards. For such corporation or partnership, such authority shall be demonstrated to the satisfaction of City. If signature is by an agent, other than officer of a corporation or a member of a partnership, an appropriate Power of Attorney shall be on file with the City prior to signing this document.

Mailing Address: _____

Business Address: _____

City, Zip: _____

Phone: _____ **Fax:** _____

ATTACHMENT: EXHIBIT "A", Contractors Bid and Bid Price Schedule

END OF CONTRACT

**INSERT EXHIBIT A
TO THE CONTRACT AGREEMENT
(ATTACH CONTRACTOR'S BID SCHEDULE)**

**CITY OF PLACERVILLE
COUNTY OF EL DORADO, STATE OF CALIFORNIA
DEVELOPMENT SERVICES DEPARTMENT**

PAYMENT BOND

Bond No. _____

WHEREAS, the City of Placerville, Department of Public Works, hereafter referred to as "Obligee", has awarded to Contractor hereafter referred to as "Principal" a contract for the work described as follows:

**MADRONE AND GIOVANNI SEWER LIFT STATIONS REHABILITATION PROJECT
PROJECT NO.: 40330**

AND, WHEREAS, said Principal is required to furnish a bond in connection with said contract, guaranteeing the faithful performance thereof: NOW, THEREFORE, we the undersigned Principal and Surety are held and firmly bound unto the Obligee, in the sum of _____ Dollars (\$ _____) to be paid to the Obligee, for which payment we bind ourselves, jointly and severally.

THE CONDITION OF THIS OBLIGATION IS SUCH,

That is said Principal or its subcontractors shall pay any of the persons named in Civil Code Section 3181, or amounts required to be deducted, Unemployment Insurance Code with respect to work or labor performed by such claimant, or any amounts required to be deducted, withheld, and paid over to the Franchise Tax Board from the wages of employees or the Principal and his subcontractors pursuant to Section 18806 of the Revenue and Taxation Code, with respect to such work and labor, that the surety herein will pay for the same in an amount not exceeding the sum specified in this bond, otherwise the above obligation shall be void. In case suit is brought upon this bond, the surety will pay a reasonable attorney's fee to be fixed by the court.

This bond shall inure to the benefit of any of the persons named in Civil Code Section 3181 as to give right of action to such persons or their assigns in any suit brought upon this bond.

Dated: _____, 20____.

Correspondence or Claims relating to this bond should be sent to the Surety at the following address:

PRINCIPAL

SURETY

ATTORNEY-IN-FACT

NOTE: Signatures of those executing for the surety must be properly acknowledged and a Power of Attorney attached.

CERTIFICATE OF ACKNOWLEDGEMENT

State of California, County of _____.

On this _____ day of _____ in the year of _____, before me
_____, personally appeared
_____, personally known to be (or proved to me
on the basis of satisfactory evidence) to be the person whose name is subscribed to this
instrument as the attorney in fact of
_____, and acknowledged to me that he
subscribed the name of the said company thereto as surety, and his own name as attorney-of-
fact.

(SEAL)

Notary Public

CITY OF PLACERVILLE
COUNTY OF EL DORADO, STATE OF CALIFORNIA
DEVELOPMENT SERVICES DEPARTMENT

PERFORMANCE BOND

Bond No. _____

KNOW ALL MEN BY THESE PRESENT, that we, _____ the Contractor in the Contract hereto annexed, as Principal, and _____ as Surety, are firmly bound unto the City of Placerville, a Political Subdivision of the State of California, hereinafter called the "Obligee" in the sum of _____ DOLLARS (\$ _____) lawful money of the United States, for which payment, well and truly to be made, we bind ourselves, jointly and severally, firmly by these present.

Signed, sealed and dated: _____

The condition of the above obligation is that if said Principal as Contractor in the Contract hereto annexed shall faithfully perform each and all of the conditions of said Contract to be performed by him, and shall furnish all tools, equipment, apparatus, facilities, transportation, labor and material, other than material, if any, agreed to be furnished by the Obligee, necessary to perform and complete, and to perform and complete in a good and workmanlike manner, the work of ***Madrone and Giovanni Sewer Lift Stations Rehabilitation Project, Project No. 40330*** in strict conformity with the terms and conditions set forth in the Contract hereto annexed, then this obligation shall be null and void,; otherwise bond shall remain in full force and effect and the said Surety will complete the Contract work under its own supervision by Contract or otherwise, and pay all costs thereof for the balance due under terms of the Contract, and the said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder shall in any wise affect its obligation on this bond, and it does hereby waive notice of any such change, extension or time, alteration or addition to the terms of the Contract or to the work.

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

This guarantee shall insure the Obligee during the work required by any Contract and for a period of one (1) year from the date of acceptance of the work against faulty of improper materials or workmanship that may be discovered during that time.

No right of action shall accrue under this bond to of for the use of any person other than the Obligee named herein.

Dated: _____, 20____.

Correspondence or Claims relating to this bond should be sent to the Surety at the following address:

PRINCIPAL

SURETY

ATTORNEY-IN-FACT

NOTE: Signatures of those executing for the surety must be properly acknowledged and a Power of Attorney attached.

CERTIFICATE OF ACKNOWLEDGEMENT

State of California, County of _____.

On this _____ day of _____ in the year of _____, before me
_____, personally appeared
_____, personally known to be (or proved to me on
the basis of satisfactory evidence) to be the person whose name is subscribed to this instrument
as the attorney in fact of _____, and
acknowledged to me that he subscribed the name of the said company thereto as surety, and his
own name as attorney-of-fact.

(SEAL)

Notary Public

END OF SECTION

**SECTION 00550
NOTICE TO PROCEED**

Date: _____

To: _____
(Name of Contractor)

Address: _____

Project: Madrone and Giovanni Sewer Lift Stations Rehabilitation Project

Project No.: 40330

You are notified that the Contract Times under the above contract will commence to run on _____ On that date, you are to start performing your obligations under the Contract Documents. In accordance with **THE CONTRACT**, the date of Final Completion is _____.

Before you may start any Work at the Site, you must:

1. Submit certified Safety Program as required by California Code of Regulations, Title 8, General Industry Safety Orders and other related regulatory requirements.
2. Submit copies of applicable permits (Example: Cal OSHA Annual Trench Excavation Permit) Submit approved fire protection plan, if applicable
3. Attend Pre-Construction conference.

CITY OF PLACERVILLE

By: _____

Its: _____

Copy to Owner's Representative
Construction Manager
Engineer

*****END OF SECTION*****



CITY OF PLACERVILLE, CALIFORNIA
DEVELOPMENT SERVICES DEPARTMENT
ENGINEERING DIVISION

MADRONE AND GIOVANNI SEWER LIFT STATIONS REHABILITATION PROJECT

City Project No. 40330

SPECIAL PROVISIONS

**SECTION 00700
SPECIAL PROVISIONS**

SECTION A – DESCRIPTION OF PROJECT

The location and scope of work for this project are as described in the Contract Specifications.

1. Contract Documents: The work shall be done in accordance with the following documents which, by reference, are incorporated into the contract:
 - A. Notice to Bidders (Section 00020) As contained herein and published in periodicals of the local area.
 - B. Instructions to Bidders (Section 00100) As contained herein and used by bidder in preparing formal proposal to do work.
 - C. Proposal (Section 00310) Including the bond required therewith, all as contained in blank form herein, used by the bidder making formal proposal to do the work.
 - D. Contract (Section 00510) The formal agreement between the City of Placerville and the Contractor, including the Faithful Performance Bond, and the Payment (Labor and Materials) Bond.
 - E. Standards – Except as stated in the Contract Specifications all work and materials shall be in accordance with the El Dorado Irrigation District Design and Construction Standards current edition, El Dorado County Community Development Agency, Design and Improvement Standards Manual and Standard Construction Specifications, current editions, the City of Placerville Design and Improvement Standards Manual, current edition, and the Standard Specifications of the State of California, current edition, which said documents are specifically referred to and by such reference made in part hereof.
 - F. Specifications for the Work – These contract specifications, special provisions, and technical specifications, including all references.
 - G. Document Precedence -- The component Contract documents are intended to provide explanation for each other. Any work shown on the Plans and not in the Specifications, or vice versa, is to be executed as if indicated in both. In case of a conflict in the Contract, the following order of precedence will govern interpretation of the Contract:
 - 1) Field Instruction or other written directives
 - 2) Addenda
 - 3) Technical Specifications
 - 4) Special Provisions
 - 5) Project Plans
 - 6) City Design and Improvement Standards Manual

- 7) County and EID Standard Drawings
- 8) County and EID Standard Specifications
- 9) State Standard Drawings
- 10) State Standard Specifications

2. Changes in the Work

A. Form of Change:

- 1) The City may, at any time, by written order, make changes in the Work as deemed necessary by the Engineer. Such changes include, but are not limited to, changes:
 - a) In the Specifications or Plans;
 - b) In the sequence, method or manner of performance of the Work;
 - c) In the owner-furnished facilities, equipment, materials, services or site; or
 - d) Directing acceleration of the Work.
- 2) If such changes cause an increase or decrease in the Contractor's cost of, or time required for, performance of the Contract, an equitable adjustment will be made and the Contract modified in writing accordingly.

- a) Change Orders. A change pursuant to this Section A-2B will be in the form of a Contract Change Order which will set forth the work to be done or the method by which the change and cost adjustment, if any, will be determined, and the time of completion of the work.

Upon receipt of a Contract Change Order, the Contractor shall proceed with the ordered work. If ordered in writing by the Engineer, the Contractor shall proceed with the work so ordered prior to actual receipt of a Contract Change Order. A Contract Change Order executed by the Contractor and approved by the Engineer is an executed Contract Change Order as that term is used throughout this Section.

- b) Change Order Protests. A Contract Change Order may be issued to the Contractor at any time. Should the Contractor disagree with any terms or conditions set forth in a Contract Change Order which the Contractor has not executed, the Contractor shall submit a written protest to the Engineer within fifteen (15) days after the receipt of such Contract Change Order. The protest shall state the points of disagreement and, if possible, the quantities and cost involved. If a written protest is not submitted, payment will be made as set forth in the Contract Change Order. Such payment shall constitute full compensation for all work

included therein or required thereby. Such unprotested Contract Change Orders shall be considered as executed Contract Change Orders.

Where the protest concerning a Contract Change Order relates to compensation, the compensation payable for all work specified or required by the Contract Change Order to which such protest relates will be determined in the same manner as provided in Section A-2B. The Contractor shall keep full and complete records of the cost of such work and shall permit the Engineer to have such access thereto as may be necessary to assist in the determination of the compensation payable for such work. Where the protest concerning a Contract Change Order relates to the adjustment of time and the completion of the Work, the time to be allowed therefore will be determined as provided in this Section.

The consent of the Contractor's sureties shall not be required as to any change or Extra Work, and the liability of the Contractor's Bonds shall be increased or decreased accordingly without notice to the sureties.

B. Procedures and Allowable Costs on Changes and Additions to Work

1) Forms of Payment

If the change in, or addition to, the Work will result in an increase in the contract sum, the City shall have the right to require the performance thereof. The compensation to be paid for any such work shall, in the City's sole discretion, be determined in one or more of the following ways:

- a) By agreed unit prices, if unit prices are required by the City's bid form and provided with contractor's bid;
- b) By proposal and acceptance of an agreed upon lump sum; or
- c) On a time and materials basis.

Until one of the above methods is agreed on, or if the Work is to be paid for on a time and materials basis, the Contractor shall keep full and complete records of the cost of such work in the form and manner prescribed by the Engineer and shall permit the Engineer to have access to such records as may be necessary to assist in the determination of the compensation payable for such work.

2) Lump Sum Payment

The City, in its sole and absolute discretion, may request a lump sum proposal by Contractor to perform the change in, or addition to, the Work performed. Such lump sum proposal shall be submitted by the Contractor within ten (10) days of the City's request therefor. Request for a lump sum proposal by City shall not be deemed an election by City to have the Work performed on a lump sum basis. Costs of preparing the proposal shall not be compensable.

- a) Contents of Lump Sum Proposal. The Contractor's proposal shall be itemized and segregated by labor and materials for the various components of the change (no aggregate labor total will be acceptable).

The proposal shall be accompanied by signed proposals of any Subcontractors which will perform any portion of the change, and of any persons who will furnish materials or equipment for incorporation therein. The proposal shall also include the Contractor's estimate of the time required to perform the changes or additional work.

- b) Computation of Labor Costs. The portion of the proposal relating to labor, whether by the Contractor's forces or the forces of any of its Subcontractors, may include the projected wages of the reasonably anticipated Site labor, including foremen, who will be directly involved in the change in the Work. These projected wages shall not include charges for assistant superintendents, superintendents, office personnel, timekeepers and maintenance mechanics.

Labor costs may also include Contractor's overhead and profit which shall be computed by adding to the labor costs either up to fifteen percent (15%) of the projected wages, but not payroll costs, or the labor surcharge set forth in the California Department of Transportation publication entitled Labor Surcharge And Equipment Rental Rates, which is in effect on the date upon which the Work is accomplished and which is a part of the Contract. The method of computing the overhead and profit shall be solely within the discretion of the City.

The labor surcharge, if used, shall constitute full compensation for all payments imposed by State and Federal laws and for all other payments made to, or on behalf of, the worker, other than actual wages as defined above or travel and subsistence payments as provided by Labor Code Section 1773.8. No time or charges will be allowed except when the workers are actually engaged in the proper, efficient and diligent performance or completion of the extra work as authorized. Overtime shall not be worked without prior approval of the Engineer.

- c) Computation of Equipment and Materials Costs. The portion of the proposal relating to materials may include the reasonably anticipated direct costs to the Contractor or to any of its Subcontractors of materials to be purchased for incorporation in the change in the Work. This portion of the proposal may also include transportation and applicable sales or use taxes. Up to fifteen percent (15%) of these direct costs may be included as overhead and profit for the Contractor or any such Subcontractor (such overhead and profit to include all small tools).

This portion of the proposal may further include the Contractor's and any of its Subcontractors' reasonably anticipated costs for the rental and operation of prime construction and automotive equipment furnished and used in connection with the change in the Work. The equipment rental and operation rates used shall be the current edition of the Department of Transportation, Division of Construction, Equipment Rental Rates. These costs shall not include charges for listed equipment or major tools with a new cost of \$500.00 or less. No time charges shall be allowed except for equipment actually used for the proper and efficient performance or completion of the authorized change in the Work.

- d) Subcontractors. The lump sum proposal may include up to five percent (5%) of the amount which the Contractor will pay to any of its Subcontractors for the change in the Work as allowable overhead and profit to the Contractor.
- e) Failure to Submit Lump Sum Proposal. In the event that the Contractor fails to submit its proposal within the designated period, the Engineer may direct the Contractor to proceed with the change or addition to the Work and the Contractor shall so proceed. The Engineer shall unilaterally determine the reasonable costs and time to perform the work in question, which determination shall be final and binding upon the Contractor.
- f) Failure to Agree on Lump Sum Amount. In the event that the parties are unable to agree as to the reasonable costs and time to perform the change in or addition to the Work based upon the Contractor's proposal and the Engineer and City do not elect to have the change in the Work performed on a time and material basis, the Engineer and City shall make a unilateral determination of the reasonable cost and time to perform the change in the Work, based upon their own estimates, the Contractor's submission or combination thereof. In such instances, a Change Order shall be issued for the amount of costs and time determined by the Engineer and the City and shall become binding upon the Contractor unless the Contractor submits its protest in writing to the City within thirty (30) days of the issuance of the Change Order.

The City has the right to direct the Contractor in writing to perform the change in the Work which is the subject of the Change Order.

Failure of the parties to reach agreement regarding the costs and time of the performing the change in the Work and/or any pending protest shall not relieve the Contractor from performing the change in the Work promptly and expeditiously.

3) Payment by Unit Prices

If any of the items included in the lump sum proposal are covered by unit prices contained in the contract document, the City may, if it requires the change in the Work to be performed on a lump sum basis, elect to use these unit prices in lieu of the similar items included in the lump sum proposal in which event an appropriate deduction will be made in the lump sum amount prior to the application of any allowed overhead and profit percentages. No overhead and profit shall be applied to any unit prices.

4) Payment on a Time and Material Basis

If the City elects to have the change or addition to the Work performed on a time and material basis, the Work shall be performed, whether by the Contractor's forces or the forces of any of its Subcontractors or Sub- subcontractors, at actual costs to the entity or entities performing the change in the Work. Actual costs shall not include any charge for administration, clerical expense, supervision or superintendence of any nature whatsoever, including foremen, or the costs, use or rental of tools or plant.

Contractor may add fifteen percent (15%) thereof as the total overhead and profit to the entity or entities actually performing the change. This fifteen percent (15%), however, shall not be applied against any payroll costs as defined in Section A-2B with respect to lump sum proposals. If the entity or entities actually performing the work are Subcontractors or Sub-subcontractors, the Contractor shall be allowed five percent (5%) of the total charge of the performing entity or entities (including mark-up) as Contractor's mark-up. No other mark-ups shall be allowed hereunder.

The Contractor shall submit to the City daily work and material tickets, to include the identification number assigned to the change in the Work, the location and description of the change in the Work, the classification of labor employed (and names and social security numbers), the material used, the equipment rented (not tools) and such other evidence of cost as the City may require. The City may require authentication of all time and material tickets and invoices by persons designated by the City for such purpose. The failure of the Contractor to secure any required authentication shall, if the City elects to treat it as such, constitute a waiver by the Contractor of any claim for the cost of that portion of the Change in the Work covered by a non-authenticated ticket or invoice; provided, however, that the authentication of any such ticket or invoice by the City shall not constitute an acknowledgment by the City that the items thereon were reasonably required for the Change in the Work.

5) Limitations on Changes

The Contractor shall not be entitled to any amount for indirect costs, damages or expenses of any nature, including, but not limited to, so-called "impact" costs, labor inefficiency, wage, material or other escalations beyond the prices upon which the proposal is based and to which the parties have agreed pursuant to the provisions of this Section, and which the Contractor, its Subcontractors and Sub-subcontractors or any other person may incur as a result of delays, interferences, suspensions, changes in sequence or the like, for whatever cause, whether reasonable or unreasonable, foreseeable or unforeseeable, or avoidable or unavoidable, arising from the performance of any and all changes in the work performed pursuant to this Section. It is understood and agreed that the Contractor's sole and exclusive remedy in such event shall be recovery of its direct costs as compensable hereunder and an extension of the time of the Contract, but only in accordance with the provisions of the Contract Documents.

It is expressly agreed that Contractor shall not be entitled to claim damages for anticipated profits on any portion of the Work that may be deleted. The amount of any adjustment for work deleted shall be estimated at the time deletion of work is ordered and the estimated adjustment will be deducted for the subsequent monthly pay estimates. The City reserves its rights under Section A-2H to audit Contractor's as-bid profit in connection with any deductive change, to arrive at a final adjustment. Contractor's as-bid profit shall be reduced pro rata according to the proportion of the original contract value less as-bid profit, represented by the work deleted.

The City reserves the right to contract with any person or firm other than the Contractor for any or all Extra Work.

- C. Unilateral Change in or Addition to the Work. Notwithstanding the above, the City, directly or through the Engineer, may direct the Contractor in writing to perform changes in or additions to the scope of the Contract. The Contractor shall perform such work and the parties shall proceed pursuant to the provisions of Section A-2B.
- D. Changes in Character of Work. If an ordered change in the Plans or Specifications materially changes the character of the Work of a Contract item from that upon which the Contractor based its bid price, and if the change increases or decreases the actual unit costs of such changed item as compared to the actual or estimated unit cost of performing the Work of the item in accordance with the Specifications and Plans originally applicable thereto, in the absence of an executed Contract Change Order specifying the compensation payable, an adjustment in compensation therefor will be made in accordance with the following:
- 1) The basis of such adjustment in compensation will be the difference between the Contract unit-price to perform the work of the item or portion thereof involved in the change as originally planned and the actual unit cost of performing the work of the item or portion thereof involved in the change, as changed. Actual unit costs will be as agreed upon by the Contractor and the Engineer. If they cannot agree or if there is no unit- price for the subject work, then the costs of the work will be determined by the Engineer in the same manner as if the work were to be paid for on the time and material basis as provided in Section A-2B. Any such adjustment will apply only to the portion of the work of the item actually changed in character.
 - 2) Failure of the Engineer to recognize the change in character of the work at the time the Contract Change Order is issued shall in no way be construed as relieving the Contractor of its duties and responsibility of filing a written protest within the ten (10) day limit as herein above provided.
- E. Differing Site Conditions. The Contractor shall promptly, and before the following conditions are disturbed, notify the City in writing of any:
- 1) Material that the Contractor believes may contain hazardous waste, as defined in Section 25118 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; or
 - 2) Subsurface or latent physical conditions at the Site differing from those indicated in the Contract Documents; or
 - 3) Unknown conditions at the Site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract.

The Engineer shall thereupon promptly investigate the conditions. If the Engineer finds that they do involve hazardous waste, or do materially differ and cause and decrease or increase in the Contractor's cost of time of performance, the Engineer will issue and change order as appropriate. Any increase or decrease of cost resulting from such changes shall be adjusted in the manner provided in Section A-2B for adjustments as to extra and/or additional work and changes. However, neither the City nor the Engineer shall be liable or

responsible for additional work, costs or changes to the Work due to material difference between actual conditions and any geotechnical, soils and other reports, surveys and analyses made available for the Contractor's review. In the event that a dispute arises between the City and the Contractor, whether the conditions materially differ, or involve hazardous waste, or cause and decrease or increase 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 by the Contract, but shall proceed with all work to be performed under the Contract, the procedures applicable to claims for extra costs shall then apply.

F. Civil Action Procedures

The following procedures shall apply to all civil actions filed to resolve claims under this contract.

1) Non-Binding Mediation

Within sixty (60) days, but no earlier than thirty (30) days, following the filing of responsive pleadings, the court shall submit the matter to non-binding mediation unless waived by mutual stipulation of both parties. The mediation process shall provide for the selection within fifteen (15) days by both parties of a disinterested third person as mediator, shall be commenced within thirty (30) days of the submittal, and shall be concluded within fifteen (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 fifteen-(15) day period, any party may petition the court to appoint the mediator.

2) Judicial Arbitration

- a) 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 subsection consistent with the rules pertaining to judicial arbitration.
- b) Notwithstanding any other provision of law, upon stipulation of the parties, arbitrators shall be experienced in construction law. 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.
- c) 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 appealing an arbitration award who 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 appeal.

3) Intent

- a) It is the intention of this Section that the differences between the parties, arising under and by virtue of the Contract, be brought to the attention of the Engineer at the earliest possible time in order that such matters may be settled, if possible, or other appropriate action promptly taken. The Contractor hereby agrees that it shall have no right to additional compensation for any claim that may be based on any act, failure to act, event, thing or occurrence for which no written notice of potential claim, as herein required, was timely filed.
- b) In the event of an emergency endangering life or property, the Contractor shall act as stated in Section B-3E herein, and after execution of the emergency work shall present an accounting of labor, materials and equipment in connection therewith. The procedure for any payment that may be due to for emergency work will be as specified in Section A-2 herein.
- c) The City shall pay money as to any portion of a claim which is undisputed, except as otherwise provided in the contract.
- d) In any suit filed under this section, 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.

G. Claims for Extra Costs

1) Notice of Potential Claims

- a) It is hereby mutually agreed that the Contractor shall not be entitled to the payment of any additional compensation for any cause, including any act, or failure to act, by the Engineer, or the happening of any event, thing or occurrence, unless the Contractor provides the Engineer with written notice of the potential claims as hereinafter specified. Compliance with this section, however, shall not be a prerequisite as to matters within the scope of the protest provisions in Section A-2A.
- b) The written notice of potential claims shall set forth the reasons for which the Contractor believes additional compensation will or may be due, the nature of the costs involved, and, insofar as possible, the amount of the potential claim. The notice as above required shall be given to the Engineer prior to the time that the Contractor commences performance of the Work giving rise to the potential claim for additional compensation, if based on an act or failure to act by the Engineer, or in all other cases within ten (10) days after the happening of the event, thing or occurrence giving rise to the potential claim.

2) Construction Claims

- a) The Contractor may submit a claim to the Engineer concerning any matter for which a protest under Section A-2A, or a notice of potential claim, is

filed. Such claims, or potential claims, shall be submitted to the Engineer within ten (10) calendar days following the submission of the protest or notice, unless, due to the nature of the claim or the uncompleted state of the Work, it is impracticable to determine the amount or the extent of the claim within such period. In such cases, claims shall be submitted at the earliest practicable time in which such a determination can be made. In any event, all claims shall be filed on or before the date of the final release by the Contractor as provided for in Section B-8I. The contractor waives his rights to submit a claim if the notice of potential claims process or protest process is not followed per their respective sections

- b) All claims shall be in writing and shall set forth clearly and in detail, for each item of additional compensation claimed, the reasons for the claim, reference to applicable provisions of the Specifications, the nature and the amount of the cost involved, the computations used in determining such costs, all pertinent factual data and all the documents necessary to substantiate the claim. The Contractor shall maintain complete and accurate records of the cost or any portion of the Work for which additional compensation is claimed, and shall provide the Engineer with copies thereof, as required.
- c) The contractor waives his rights to submit a claim if the notice of potential claims process or protest process is not followed per their respective sections.

3) Resolution of Constructions Claims \$50,000 or Less

- a) The City will respond in writing to all written claims for less than or equal to fifty thousand dollars (\$50,000) within forty-five (45) days of receipt of the claim, or may request, in writing, within thirty (30) days of receipt of the claim, any additional documentation supporting the claim or relating to defenses or claims the City may have against the claimant.
- b) If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the City and the claimant.
- c) The City's written response to the claim, as further documented, shall be submitted to the claimant within fifteen (15) days after receipt of the further documentation or within a period of time no greater than that taken by the claimant in producing the additional information, whichever is greater.

4) Resolution of Claims Greater than fifty thousand dollars (\$50,000) and Less than or Equal to three hundred and seventy-five thousand dollars (\$375,000).

- a) The City will respond in writing to all written claims for of over fifty thousand dollars (\$50,000) and less than or equal to three hundred seventy-five thousand dollars (\$375,000) within forty-five (45) days of receipt of the claim, or may request, in writing, within thirty (30) days of receipt of the claim, any additional documentation supporting the claim or relating to defenses or claims the City may have against the claimant.

- b) If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the City and the claimant.
- c) The City's written response to the claim as further documented, shall be submitted to the claimant within thirty (30) days after receipt of the further documentation, or within a period of time no greater than that taken by the claimant in producing the additional information or requested documentation, whichever is greater.

5) Resolution of Claims Greater than three hundred and seventy-five thousand dollars (\$375,000).

The Engineer shall, within a reasonable time after the presentation of any claim in excess of three hundred and seventy-five thousand dollars (\$375,000), make a decision in writing on such claim.

All decisions of the Engineer shall be final unless the Contractor, within ten (10) days after receipt of the Engineer's decision, files a written protest with the Engineer stating clearly and in detail the basis of the protest.

Such protest shall be forwarded promptly by the Engineer to the City Council, who will issue a decision on such protest. It is hereby agreed that the Contractor's failure to protest the Engineer's determination or instruction within ten (10) days after such determination or instruction is transmitted to the Contractor shall constitute a waiver by the Contractor of all rights to further protest, judicial or otherwise.

6) Meet and Confer Conference

- a) If the claimant disputes the City's written response, or the City fails to respond within the time prescribed, the claimant may so notify the City, in writing, either within fifteen (15) days of receipt of the City's response or within fifteen (15) days of the City'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 City will schedule a meet and confer conference within thirty (30) days for settlement of the dispute.
- b) If, following the meet and confer conference, the claim or any portion thereof remains in dispute, the claimant 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 the claimant submits its written claim pursuant to subdivision (1) until the time the claim is denied, including any period of time utilized by the meet and confer conference.

7) Contractor's Duty During Claim Resolution

The Contractor shall proceed with the Work in accordance with the plans and

specifications and determinations and instructions of the Engineer during the resolution of any claims disputes.

H. City's Right to Audit and Preservation of Records

- 1) The Contractor shall maintain books, records and accounts of all costs in accordance with generally accepted accounting principles and practices. The City and its authorized representatives shall have the right to audit the books, records and accounts of the Contractor under any of the following conditions:
 - a) The Contract is terminated for any reason in accordance with the provisions of the Contract Documents in order to arrive at equitable termination costs;
 - b) In the event of a disagreement between the Contractor and the City over the amount due the Contractor under the terms of the Contract;
 - c) To check or substantiate any amounts invoiced or paid which are required to reflect the costs of the Contractor, or the Contractor's efficiency or effectiveness under this Contract or in connection with extras, changes, claims, additions, backcharges, or others, as may be provided for in this Contract; and/or
 - d) If it becomes necessary to determine the City's rights and the Contractor's obligations under the Contract or to ascertain facts relative to any claim against the Contractor which may result in a charge against the City;
 - e) To determine any difference in cost occasioned by a permissible substitution; and /or
 - f) For any other reason in the City's sole judgment.
- 2) Contractor shall provide the City (or its representatives), unlimited, reasonable access during working hours to the Contractor's books and records. The City's audit rights shall be liberally construed in the City's favor.
- 3) The Contractor, from the effective date of final payment or termination hereunder, shall preserve and make available to the City for a period of three (3) years thereafter, at all reasonable times at the office of the Contractor (but without any charge to the City), all its books, records, documents, photographs, micro-photographs, and other evidence bearing on the costs and expenses of the Contractor under this Contract and relating to the Work hereunder.
- 4) The City will make all payments required of it under this Contract subject to audit, under circumstances stated above, which audit may be performed at the City's option, either during the Contract time period or during the record retention time period. Regardless of authorization, approval or acceptance, signatures or letters which are given by the City and are part of the City's control systems or are requested by the Contractor, the payments made under this Contract shall not constitute a waiver or agreement by the City that it accepts as correct the billings, invoices or other charges on which the

payments are based. If the City's audit produces a claim against the Contractor, the City may pursue all its legal remedies even though it has made all or part of the payments required by this Contract.

- 5) If any audit by the City or its representative discloses an underpayment by the City pursuant to the terms of the Contract Documents, the City shall have the duty to pay any amount found by the audit to be owed to the Contractor. If such audit discloses an overpayment, the Contractor shall have the obligation to reimburse the City for the amount of the overpayment. The City's right to claim reimbursement from the Contractor of any overpayment shall not be terminated or waived until three years after the completion of the City's audit or upon the termination of audit rights under subparagraph (f), below, whichever date is later. The obligation of the Contractor to make reimbursements hereunder shall not terminate except as provided by law.
- 6) The City's right to audit and the preservation of records shall terminate at the end of three (3) years after the date final payment is made or termination of the Contract. The Contractor shall include this "Right to Audit and Preservation of Records" clause in all subcontracts issued by it and it shall require the same to be inserted by all Sub-subcontractors in their subcontracts, for any portion of the work. Should Contractor fail to include this clause in any such contract or Sub-subcontractor contract, or otherwise fail to insure the City's rights hereunder, Contractor shall be liable to the City for all costs, expenses and attorney's fees which the City may have to incur obtaining or attempting to obtain an audit or inspection of or the restoration of records which otherwise would have been available to the City from the persons under this clause. The City or its authorized representative may conduct such audit.

3. Equal Employment Opportunity. During the performance of this contract, the Contractor agrees as follows:

That the Contractor will not, because of race, religious creed, color, sex, national origin or ancestry of any person, refuse to hire or employ any applicant or to bar or discharge any employee from employment, or to discriminate against any employee in compensation, or in terms, conditions or privileges of employment and that the Contractor will take affirmative action to insure that every applicant for employment and every employer will receive equal opportunity for employment and shall be granted equal treatment with respect to compensation, terms, conditions or other privileges of employment, without regard to any employee's race, religious creed, color, sex, national origin or ancestry.

SECTION B – GENERAL REQUIREMENTS

1. Definitions and Terms

- A. Standard Specifications – The Standard Specifications of the State of California, Department of Transportation, Division of Highways, 2015 edition. Any reference therein to a State Agency or officer shall be interpreted as the corresponding City office or officer acting under this contract with address at City Hall, Placerville, California 95667.
- B. City – The City of Placerville.

- C. City Council – The governing body of the City.
- D. City Specifications – The El Dorado Irrigation District, Design and Construction Standards, current edition. Any reference therein to a County Agency or officer shall be interpreted as the corresponding City office or officer acting under this contract with address at City Hall, Placerville, California 95667.
- E. Engineer –City Engineer of the City of Placerville or his/her authorized agent who shall represent the City during the term of the contract.
- F. Laboratory – The laboratory of the City of Placerville to the extent of its capability; otherwise as defined in the Standard Specifications.

2. Proposal Requirements and Conditions

- A. General – The bidder's attention is directed to the provisions of Section 2 of the Standard Specifications, as supplemented herein, for the requirements and conditions which he/she must observe in the preparation of the proposal form and the submission of the bid.
- B. Proposal Forms – The proposal forms are bound in these Specifications which may be obtained from the office of the City of Placerville Engineering Division City Hall, 3101 Center Street, Placerville, California, as advertised in the 'Notice to Bidders.
- C. Disqualification of Bidders – In addition to the other requirements the bidder must declare in the proposal that he/she has not accepted any bid from any Subcontractor or vendor through any bid depository, By-Laws, Rules and Regulations of which prohibit or prevent the Contractor from considering any bid from any Subcontractor or vendor which is not processed through said bid depository or which prevent any Subcontractor or vendor from bidding to any Contractor who does not use the facilities of or accept bids from or through such bid depository as to their ability, financial responsibility and experience in order to be eligible for consideration of their proposal.
- E. Non-Collusion – In accordance with Public Contract Code Section 7106, a Non-Collusion Affidavit is included in the proposal. Signing the proposal shall also constitute signature of the Non-collusion Affidavit.

3. Award and Execution of Contract, and Insurance Requirements

- A. General – The bidder's attention is directed to the provisions of Section 3 of the Standard Specifications, as supplemented herein, for the requirements of the Contract.
- B. Award of Contract
 - 1) The City reserves the right to accept or reject any and all Bids for a period of sixty (60) days after the date of opening, and to waive any minor informality or irregularity in any Bid. No Bid can be withdrawn during that period.
 - 2) The City reserves the right to reject any or all Bids, including, without limitation, the right to reject any non-conforming, non-responsive, unbalanced, or conditional bids.

C. Contract Bonds

The successful bidder shall furnish with the Contract a FAITHFUL PERFORMANCE BOND and a PAYMENT (LABOR AND MATERIALS) BOND, each in the amount of 100% of the total bid, on the forms prescribed by the City.

D. Responsibility of Contractor, Hold Harmless & Indemnity Agreement

The contractor shall take all responsibility for the work and shall defend, indemnify, release and hold harmless the City, its officers, officials, employees, agents and volunteers, from all claims, loss, damage, injury, and liability of every kind, nature, and description, directly or indirectly arising from the performance of the contract of work regardless of responsibility for negligence (including costs and expenses, which include attorney's fees, incurred in connection therewith) and from any and all claims, loss, damage, injury, and liability, howsoever the same may be caused, resulting directly or indirectly from the nature of the work covered by the contract, regardless of responsibility for negligence (including costs and expenses, which include attorney's fees, incurred in connection therewith), but excluding liability due to the sole negligence or willful misconduct of the City.

The City, pursuant to this contract and indemnity agreement, may, at the time of preparing and certifying the final voucher, and as a condition of preparing and certifying the same, require the Contractor to continue his/her bond or any part thereof, as security against any such unsatisfied claims, for a time not exceeding the time when such claims would be legally barred. Approval of the insurance under this hold harmless and responsibility clause.

E. Insurance and Liability

1) Insurance

Contractor shall procure and maintain for the duration of the contract insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the Work hereunder by the Contractor, its agents, representatives, employees or Subcontractors. The cost of such insurance shall be included in the Contractor's bid.

- a) Neither the Contractor nor any Subcontractor shall commence any work until all required insurance has been obtained at their own expense. Such insurance must have the approval of the City as to limit, form, and amount, and shall be placed with insurers with a current A.M. Best's rating of no less than A:VII.
- b) Any insurance bearing on adequacy of performance shall be maintained after completion of the Project for the full guarantee period.
- c) Prior to execution of the Contract, the Contractor shall furnish the City with original endorsements effecting coverage for all policies required by the Contract. The Contractor shall not permit any Subcontractor identified in the Designation of Subcontractors form to commence work on this Project until such Subcontractor has furnished the City with original endorsements effecting coverage for all insurance policies required by the Contract. The endorsements are to be on forms provided or approved by the City. The City may require the Contractor or any Subcontractor to furnish complete certified copies for all insurance policies

affecting the coverage required by the Contract.

- d) All of the Contractor's policies shall contain an endorsement providing that written notice shall be given to the City at least sixty (60) calendar days prior to termination, cancellation, or reduction of coverage in the policy.
- e) Any policy or policies of insurance that the Contractor elects to carry as insurance against loss or damage to its construction equipment and tools shall include a provision therein providing a waiver of the insurer's right to subrogation against the City or its officers.
- f) The requirements as to the types, limits, and the City's approval of insurance coverage to be maintained by the Contractor are not intended to and shall not in any manner limit or qualify the liabilities and obligations assumed by the Contractor under the Contract.
- g) In addition to any other remedy the City may have, if the Contractor or any of the Subcontractors fail to maintain the insurance coverage as required in this Section, the City may obtain such insurance coverage as is not being maintained, in form and amount substantially the same as required herein, and the City may deduct the cost of such insurance from any amounts due or which may become due the Contractor under this Contract.
- h) The Contractor and all Subcontractors shall, at their expense, maintain in effect at all times during the performance of work under the Contract not less than the following coverage and limits of insurance, which shall be maintained with insurers and under forms of policy satisfactory to the City. The maintenance by the Contractor and all Subcontractors of the following coverage and limits of insurance is a material element of this Contract. The failure of the Contractor or any Subcontractor to maintain or renew coverage or to provide evidence of renewal may be treated by the City as a material breach of this contract.

I. Worker's Compensation and Employer's Liability Insurance

(a) Worker Compensation

The Contractor and all Subcontractors shall maintain insurance to protect the Contractor or Subcontractor from all claims under Worker's Compensation and Employer's Liability Acts, including Longshoremen's and harbor Workers' Act. Such coverage shall be maintained, in type and amount, in strict compliance with all applicable State and Federal statutes and regulations. The Contractor shall execute a certificate in compliance with Labor Code Section 1861, on the form provided in the Contract Documents.

(b) Claims Against City

If an injury occurs to any employee of the Contractor or any of the Subcontractors for which the employee or its dependents, in the event of its death, may be entitled to compensation from the City under the provisions of the Acts, or for which compensation is claimed from the City, there will be retained out of the sums due the Contractor under this Contract, an amount sufficient to cover such compensation as fixed by the Acts, until such compensation is paid or it is determined that no compensation is due. If the City is required to pay such compensation, the amount so paid will be deducted and retained from such sums due, or to become due, the Contractor.

II. Commercial General and Automobile Liability Insurance

The Contractor shall maintain in effect at all times during the performance of the work hereunder not less than the following coverages and limits of Commercial General and Automobile Liability insurance:

(a) Form and Amount

The insurance shall include, but shall not be limited to, protection against claims arising from death, bodily injury, personal injury, or damage to property resulting from actions, failures to act, operations or equipment of the insured, or by its employees, agents or consultants, or by anyone directly or indirectly employed by the insured. The amount of insurance coverages shall not be less than the limits stated in the Appendix section of this document. Any deductibles must be declared to and approved by the City. At the option of the City, either: the insurer shall reduce or eliminate such deductibles as respects the entity, its officers, officials, employees and volunteers; or the Contractor shall procure a bond guaranteeing payment of losses and related investigations, claim administration expenses, and defense expenses.

The commercial general and automobile liability insurance coverage shall also include the following:

(b) Additional Requirements

- i) Provisions or endorsement naming the City, the Engineer and the City's consultants, and each of their officers, employees, and agents, as additional insureds with respect to any potential liability arising out of the performance of any work under the Contract, and providing that such insurance is primary insurance as respects the interest of the City and the Engineer, and its consultants, and each of their officers, employees, and agents and that any other insurance, risk pool membership, or other liability protection maintained by the City or maintained by the Engineer is excess to the insurance required hereunder, and will not be called upon to contribute to any loss.
- ii) "Cross Liability" or "Severability of Interest" clause.
- iii) Broad Form Property Damage, Personal Injury, Contractual Liability, Protective Liability, and Completed Operations coverages, and elimination of any exclusion regarding loss or damage to property caused by explosion or resulting from collapse of buildings or structures or damage to property underground, commonly referred to by insurers as the "XCU" hazards.
- iv) Provision or endorsement stating that such insurance, subject to all of its other terms and conditions, applies to the liability assumed by the Contractor under the Contract, including, without limitation, that set forth in Section B-3E(2), Indemnity and Litigation Costs.
- v) Provisions or endorsement stating that 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, or volunteers.
- vi) 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.

III. Builder's Risk or Installation Floater "All-Risk" Insurance

If required, before commencement of the Work, the Contractor shall submit written evidence that it has obtained for the period of the Contract, Builder's Risk "All-Risk" Completed Value Insurance and/or Inland Marine "All-Risk" Installation Floater Insurance, as may be applicable, upon the entire Project which is the subject of this Contract, including completed work and work in progress. The policy or policies of insurance shall name the Contractor, City, and Engineer as insured as their respective interests may appear, and shall include an insurer's waiver of subrogation rights in favor of each. Such insurance may have a deductible clause, but the amount of the deductible shall be subject to the approval of the City, except that the deductible on earthquake coverage may be in accordance with the underwriter's requirements.

2) Indemnity and Litigation Cost

- a) Promptly upon execution of the Contract, the Contractor specifically obligates itself and hereby agrees to protect, hold free and harmless, defend and indemnify the City, the Engineer and its consultants, and each of their officers, employees and agents, from any and all liability, penalties, costs, losses, damages, expenses, causes of action, claims or judgments, including attorney's fees, which arise out of or are in any way connected with the Contractor's, or its Subcontractors' or suppliers', performance of work under this Contract or failure to comply with any of the obligations contained in the Contract. This indemnity shall imply no reciprocal right of the Contractor in any action on the contract pursuant to California Civil Code section 1717 or section 1717.5. To the fullest extent legally permissible, this indemnity, defense and hold harmless agreement by the Contractor shall apply to any and all acts or omissions, whether active or passive, on the part of the Contractor or its agents, employees, representatives, or Subcontractor's agents, employees and representatives, resulting in claim or liability, irrespective of whether or not any acts or omissions of the parties to be indemnified hereunder may also have been a contributing factor to the liability, except such loss or damage which was caused by the active negligence, the sole negligence, or the willful misconduct of the City.
- b) In any and all claims against the City, the Engineer and each of their consultants, officers, employees and agents by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation under this Section shall not be limited in way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under Workers' Compensation statutes, disability benefit statutes or other employee benefit statutes.
- c) This indemnity shall not apply to fees and costs incurred by the City in prosecuting or defending against the Contractor in any proceeding under Sections A-2F and A-2G of these Special Provisions.

3) Protection of Work

- a) The Contractor shall be responsible for the care of all the Work until its completion

and final acceptance. The Contractor shall, at its own expense, replace damaged or lost material and repair damaged parts of the Work or the City may do the same at the Contractor's expense and the Contractor and its sureties shall be liable therefor. The Contractor shall make its own provisions for properly storing and protecting all material and equipment against theft, injury, or damage from any and all causes. Damaged material and equipment shall not be used in the Work. The Contractor shall take all risks from floods and casualties except as provided by law, and shall make no charge for the restoration of such portions of the work as may be destroyed or damaged by flood or other casualties or because of danger from flood or other casualties or for delays from such causes. The Contractor may, however, be allowed a reasonable extension of time on account of such delays, subject to the conditions herein before specified. The Contractor shall not be responsible for the cost, in excess of five percent (5%) of the contracted amount, of repairing or restoring damage to the Work, if the damage was proximately caused by an earthquake in excess of a magnitude of 3.5 on the Richter Scale or by tidal waves; provided that the Work damaged was built in accordance with accepted and applicable building standards, and the plans and specifications of the City.

- b) The Contractor shall effectively secure and protect adjacent property and structures, livestock, crops and other vegetation. If applicable, the Contractor shall open fences on or crossing the right-of-way and install temporary gates of sound construction thereon so as to prevent the escape of livestock. Adjacent fence posts shall be adequately braced to prevent the sagging or slackening of the wire. Before such fences are opened, the Contractor shall notify the owner or tenant of the property and, where practicable, the opening of the fence shall be in accordance with the wishes of the owner or tenant. The Contractor shall be responsible that no loss or inconvenience shall accrue to the owner or tenant by virtue of their fences having been opened or the gate not having been either shut or attended at all times. Where special types of fences are encountered, the Contractor shall install temporary gates made of similar materials and of suitable quality to serve the purposes of the original fences. In all cases where the Contractor removes fences to obtain workroom, the Contractor shall provide and install temporary fencing as required, and on completion of construction shall restore the original fence to the satisfaction of the Engineer. All costs of providing, maintaining and restoring gates and fencing shall be home by the Contractor. The Contractor shall provide and maintain all passageways, guard fences, lights and other facilities for protection required by public authority or local conditions.
- c) The Contractor shall use extreme care during construction to prevent damage from dust to crops and adjacent property. The Contractor, at its own expense, shall provide adequate dust control for the right-of- way and take other preventative measures as directed by the Engineer.
- d) The Contractor shall be responsible for all damage to any property resulting from trespass by the Contractor or its employees in the course of their employment, whether such trespass was committed with or without the consent or knowledge of the Contractor.
- e) The Contractor shall see that the Site is kept drained and free of all ground water and any other water which may impede the progress or execution of the Work.
- f) The Contractor shall be responsible for any damage caused by drainage or water

runoff from construction areas and from construction plant areas.

- g) In an emergency affecting the safety of life, the Work, or adjoining property, the Contractor, without special instruction or authorization from the Engineer, is hereby permitted to act at its discretion to prevent such threatened loss or injury, and the Contractor shall so act without appeal if so instructed or authorized. Any compensation claimed by the Contractor on account of emergency work shall be determined as specified under Section A-2. Should the Engineer deem an emergency condition to exist, the Contractor shall immediately do those things and take those steps ordered by the Engineer. The decision of the Engineer in this respect shall be final and conclusive. Any claims for compensation made by the Contractor on account of emergency work shall be determined as specified under Section A-2.
- h) Except as provided by Government Code Section 4215, the Contractor shall be responsible for the removal, relocation and protection of all public and private utilities, including irrigation facilities in the nature of utilities, located on the site of the construction Project if and to the extent that the same are identified in the Contract Documents, and the Contractor shall not be entitled to any extension of time or claim for damages for extra compensation in connection therewith. If and to the extent that such utilities or facilities are not identified in the Contract Documents, as between the Contractor and the City, the City will be responsible for the cost of their removal, relocation or protection, as the case may be, but the Contractor shall perform any such work in conformance with applicable provisions of Sections A-2A and A-2B, if so directed by the Engineer. In such situations the Contractor shall not be responsible for delay in completion of the Project caused by the failure of the City or the owner of the utility to provide for such removal or relocation. If the Contractor, while performing the Contract, discovers utility or irrigation facilities not identified by the City in the Contract Documents, the Contractor shall immediately notify the Engineer in writing.
- i) Subject to the provisions of this Section, where the Work to be performed under the Contract crosses or otherwise interferes with existing streams, watercourses, canals, farm ditches, pipelines, drainage channels, or water supplies, the Contractor shall provide for such watercourse or pipelines and shall perform such construction during the progress of the Work so that no damage will result to either public or private interests, and the Contractor shall be liable for all damage that may result from failure to so provide during the progress of the Work.

4) Accidents

- a) The Contractor shall provide and maintain, in accordance with Labor Code Section 6708 and OSHA requirements, adequate emergency first-aid treatment for its employees and anyone else who may be injured in connection with the Work.
- b) The Contractor shall promptly report in writing to the Engineer all accidents whatsoever arising out of or in connection with, the performance of the Work, whether on or adjacent to the site, which caused death, personal injury, or property damage, giving full details and statements of witnesses. In addition, if death or serious injury or serious damage is caused the accident shall be reported immediately by telephone or messenger to the City and the Engineer.
- c) If any claim is made by anyone against the Contractor or any Subcontractor on

account of any accident, the Contractor shall promptly report the facts in writing to the Engineer, giving full details of the claim.

5) No Personal Liability

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

F. Exclusions – This insurance does not cover tools owned by mechanics, any tools, equipment, scaffolding, staging, towers, and forms rented or owned by the Contractor, the capital value of which is not included in the cost of the work or any shanties or other structures erected for the sole convenience of the workers.

G. Beginning of Work, Time of Completion and Liquidated Damages – Time is of the essence on this contract. The Contractor shall show evidence that all necessary materials have been ordered within TEN (10) working days from the date the Notice to Proceed is issued by the Engineer or a stop work notice will be issued and any applicable working days will be charged.

The Contractor shall begin work on or before the tenth (10th) working day after the date of the Notice to Proceed, and shall diligently prosecute the same to completion within Time of Completion specified in the Contract Specifications.

It is understood that failure of the Contractor to complete the work within the stipulated number of days will or may subject the City to serious loss or damage.

Should the Contractor fail to complete the work provided for herein, within the time fixed for such completion, due allowance being made for unavoidable delays, he/she shall become liable to the City for the amount specified under Liquidated Damages in the Contract Specifications, for each day said work remains incomplete beyond the time for completion, as and for liquidated damages and not as a penalty, agreed upon by the parties to the contract, it being expressly stipulated that it would be impracticable and extremely difficult to fix the actual amount of damage. If it appears to the Contractor that he/she will not complete the work provided in this contract in the time agreed, he/she shall make written application to the City at least FIVE (5) CALENDAR DAYS PRIOR TO THE EXPIRATION OF THE TIME FOR COMPLETION, stating the reason why and amount of extension which he/she believes should be granted. The City may then, in its discretion, grant or deny, such extension.

Any money due, or to become due, the Contractor may be retained to cover the said liquidated damages, and should such money not be sufficient to cover such damages, the City shall have the right to recover the balances from the Contractor, or his/her sureties.

4. Scope of the Work

A. General – Attention is directed to the Division I – General Provisions, Section 4 of the Standard Specifications, as supplemented herein, for the requirements and conditions concerning the scope of the work.

B. Increased and Decreased Quantities – All items of work will be paid for at the

respective prices listed in the proposal or bid for any quantities of such work done and accepted by the City. No adjustments to unit prices will be made for any increase or decrease of actual, final quantities from the Engineer's estimated bid sheet quantities.

The first and second paragraphs of Section 4-1.05, "Changes and Extra Work," of the Standard Specifications are amended to read:

The City reserves the right without changing the scope of work, to make such alterations deviations, additions to or deletions from the plans and specifications, including but not limited to, the right to add or delete any portion of the work to be done with no additional compensation or change in lump sum or unit bid prices. The City also reserves the right without changing the scope of work, to increase or decrease the quantity of any item (BY UP TO 100%) or portion of the work, as may be deemed by the Engineer to be necessary or advisable and to require such extra work as may be determined by the Engineer to be required for the proper completion or construction of the whole work contemplated.

Engineer Estimate quantities are approximate only and will be used as a basis for a comparison of bids.

- C. Hours of Work – Regular working hours are 8:00 a.m. to 5:00 p.m., Monday through Friday, excluding holidays observed by the City. No work outside of the regular working hours shall be done unless previously requested by the contractor in writing and approved by the Engineer. The Contractor shall be responsible for reimbursement to the City for the cost of providing inspection outside the normal workday or on weekends or holidays. All inspection work outside the regular work hours shall be charged at each inspector's current overtime rate with applicable overhead.

All existing pits, excavations, trenches, and openings in the road surface shall be backfilled and paved to produce a level and smooth surface. All barricades and barriers shall be removed from traffic lanes, unless authorized by the Engineer. Only emergency repairs will be permitted during the holiday season (Monday of Thanksgiving week through week of January 1). Unless otherwise stipulated in the Contract documents, the holiday season as described above is accounted for in the original contract duration, and Working Days will continue to be counted during this suspension period. Baseline and progress schedules shall include this suspension period if applicable.

5. Control of the Work – Attention is directed to the Division I, Section 5 of the Standard Specifications for the requirements and conditions concerning control of the work.
6. Control of Materials – Attention is directed to the Division I, Section 6 of the Standard Specifications for the requirements and conditions concerning the control of materials.
7. Legal Relations and Responsibility
- A. General – Attention is directed to the Division I, Section 7 of the Standard Specifications, as supplemented herein, for the requirements and conditions concerning legal relations and responsibility.
- B. Hours of Labor – Eight hours labor constitutes a legal day's work. The Contractor shall

forfeit, as a penalty, to the City, \$25.00 for each work person employed in the execution of the contract by the Contractor or any Subcontractor under him/her for each calendar day during which such work person 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 of provisions of the Labor Code of the State of California, Section 1810 to Section 1815.

- C. Public Convenience and Safety – Public Convenience and Safety shall be in accordance with Section 6-12 Public Convenience and Safety of the El Dorado County Standard Construction Specifications.
- D. Damage to Private Property – Any damage to private property caused by the Contractor and adjudged to be the responsibility of the Contractor by the Engineer shall be rectified to the satisfaction of the Engineer within a reasonable time, depending on the extent of the damage. Said reasonable time shall be as determined by the Engineer, and if the condition is not rectified, the Engineer shall have the power and authority to rectify said damage and the cost thereof to be paid for by the Contractor, either by direct payment to the City of Placerville, or by deducting said amount from moneys due the Contractor.

8. Measurement and Payment

A. Measurement of Quantities

- 1) Where the Contract provides for payment on a “Lump Sum” or “Job” basis shall result in a complete structure, operating plant or system in satisfactory working condition in respect to the functional purposes of the installation, and no extra compensation will be allowed for anything omitted but fairly implied.
- 2) Payment for all work bid at a price per unit of measurement will be based upon the actual quantities of work as measured upon completion. The City does not expressly or by implication agree that the actual amount of work or materials of any class will correspond to the estimated quantities given in the proposal. The Contractor shall make no claim nor receive any compensation for anticipated profits, for loss of profit, for damages, or for any extra payment whatever because of any difference between the amount of work actually done and materials furnished and the estimated amount.
- 3) All quantities of work computed under the Contract shall be based upon measurements in accordance with the United States Measurements and Weights.
- 4) Methods of measurement are specified herein and in the Contract Specifications.

B. Scope of Payment

- 1) The Contractor shall accept the compensation provided in the Contract as full payment for furnishing all labor, materials, tools, equipment, and incidentals necessary to the completed work and for performing all work contemplated and embraced under the Contract; also for loss or damage arising from the nature of the work, or from the action of the elements, or from any unforeseen difficulties which may be encountered during the prosecution of the Work until the acceptance by the City and for all risks of every description connected with the

prosecution of the Work, also for all expenses incurred in consequence of the suspension or discontinuance of the work as provided in the Contract; and for completing the Work according to the Specifications and Plans. Neither the payment of any estimate nor of any retained percentage shall relieve the Contractor of any obligation to make good any defective work or material.

- 2) No compensation will be made in any case for loss of anticipated profits. Increased or decreased work involving supplemental agreements will be paid for as provided in such agreements.
- 3) The Work includes the preparatory work and operations needed for mobilization and demobilization of the Project.

C. Progress Estimate

For each pay period of Contract work, the Contractor shall prepare a written progress estimate of the value of all work performed under the Contract, including any amounts due the Contractor for Extra Work and Change Orders. In arriving at the value of the work done, the Contractor shall give consideration to the value of labor and materials which have been incorporated into the permanent work during the preceding month. Consideration will not be given to preparatory work done or for materials or equipment on hand. The Contractor shall verify the estimated quantities of all pay items with the City's Inspector prior to submitting a final Progress Payment Request to the Engineer.

To assist the Engineer in reviewing Progress Payment Requests, all Progress Payment Requests submitted by Contractor shall be accompanied by sufficient documentation to validate payable quantities for the preceding pay period. Documentation shall include, but is not limited, Quantity Sheets for each bid item, in a form approved by the Engineer, summarizing the daily quantity placed/installed with dimensions and location (with centerline station to station references and left or right indicated) and copies of invoices and/or trucking delivery tags.

Additional documentation may be requested by the Engineer to adequately verify any bid item quantity.

D. Progress Payments

- 1) The City will pay the Contractor ninety-five percent (95%) of the amount of each progress estimate within 30 days after receipt of an undisputed and properly submitted progress estimate from the Contractor. If the City fails to pay an undisputed progress estimate within the allotted thirty (30) days, 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. Five percent (5%) of the amount of each estimate shall be retained by the City until final completion and acceptance of all work under the Contract.
- 2) Upon receipt of a payment request, the City shall act in accordance with both of the following:
 - a) Each payment request shall be reviewed by the City as soon as practicable after receipt for the purpose of determining that the progress estimate is a proper payment request.
 - b) 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 (7) days, after receipt. A request returned pursuant to this Section shall be accompanied by a document setting forth in writing the reasons why the payment request is not proper.

- 3) The number of days available to the City to make a payment without incurring interest pursuant to this Section shall be reduced by the number of days by which the City exceeds the seven-(7) day return requirement set forth in paragraph (ii) of subdivision (b).
- 4) The Contractor may, in accordance with the provisions of Public Contracts Code section 22300, substitute securities for any monies, which the City may withhold to ensure performance under the Contract.
- 5) When, in the judgment of the Engineer, the Work is not proceeding in accordance with the provisions of the Contract, or when in the Engineer's judgment the total amount of the Work done since the last estimate amounts to less than one thousand dollars (\$1,000), no pay estimate will be prepared and no progress payment will be made.
- 6) No progress estimate or payment shall be considered to be an approval or acceptance of any work, materials or equipment. Estimated amounts and values of work done and materials and equipment furnished will be conformed to actual amounts and values as they become available in subsequent progress estimates, progress payments and the final estimate and payment. All estimates and payments will be subject to correction in subsequent progress estimates and payments and the final estimate and payment.
- 7) It is mutually agreed between the parties to the Contract that no payments made under the Contract, including progress payments and the final payment shall be evidence of the performance of the Contract, either wholly or in part, and no payment shall be construed to be an acceptance of any defective or incomplete work or improper materials.

E. Liens and Stop Notices

The Contractor agrees to keep the Work, the site of the Work and all monies held by the City free and clear of all liens and stop notices related to labor and materials furnished in connection with the Work, if permitted by law. Furthermore, the Contractor waives any right it may have to file any type of lien or stop notice in connection with the Work. Notwithstanding anything to the contrary contained in the Contract Documents, if any such lien or stop notice is filed or there is evidence to believe that lien or stop notice may be filed at any time during the progress of the Work or within the duration of this Contract, the City may refuse to make any payment otherwise due the Contractor or may withhold any payment due the Contractor a sum sufficient in the opinion of the City to pay all obligations and expenses necessary to satisfy such lien or stop notice. The City may withhold such payment unless or until the Contractor, within ten (10) days after demand therefor by the City, shall furnish satisfactory evidence that the indebtedness and any lien or stop notice in respect thereof has been satisfied, discharged and released of record, or that the Contractor has legally caused such lien or stop notice to be released of record pending the resolution of any dispute between the Contractor and any person or persons filing such lien or stop notice. If the Contractor shall fail to furnish such satisfactory evidence within ten (10) days of the demand therefor, the City may discharge such indebtedness and deduct the amount thereof, together with any and all losses, costs and damages suffered or incurred by the City from any sum payable to the

Contractor under the Contract documents, including but not limited to final payment and retained percentage. This Section shall be specifically included in all Subcontracts and purchase orders entered into by the Contractor.

F. Final Estimate

As soon as possible after the completion of the work and receipt of all documentation required to be submitted by the Contractor is received, the Engineer shall make up the final estimate of the total amount of work done, segregated as to contract item quantities and contract change order work, and the value of such work; and this amount, after deducting all previous payments and all amounts to be deducted and retained under the provisions of the contract, shall constitute the final payment. All prior estimates and payments shall be subject to correction in the final estimate.

Within fifteen (15) calendar days after the proposed final estimate is submitted to the Contractor, the Contractor shall submit to the Engineer the Contractor's written approval of said estimate or a written statement of the Contractor's exceptions thereto. If the Contractor files a statement of exceptions, it shall be in sufficient detail to enable the Engineer to ascertain the basis and amount of said claims. If the Contractor fails to file a statement within the time allowed, it shall be construed to be acceptance of the final estimate as submitted to the Contractor. Any claim of the Contractor or the Contractor's subcontractors or suppliers with respect to the performance or breach of the contract or any alterations thereof (except for payment of the balance of the contract price as set forth in the final estimate) not specifically set forth in such a statement is waived by the contractor.

G. Right to Withhold Payments

- 1) In addition to all other rights and remedies of the City hereunder and by virtue of the law, the City may withhold or nullify the whole or any part of any partial or final payment to such extent as may reasonably be necessary to protect the City from loss on account of:
 - a) Defective work not remedied, irrespective of when any such work be found to be defective;
 - b) Claims or liens filed or reasonable evidence indicating probable filing of claims or liens including, but not limited to claims under Sections 1775, 1776, or 1777.7 of the Labor Code;
 - c) Failure of the Contractor to make payments properly for labor, materials, equipment, or other facilities, or to Subcontractors and/or suppliers;
 - d) A reasonable doubt that the Work can be completed for the balance then unearned;
 - e) A reasonable doubt that the Contractor will complete the Work within the agreed time limits;
 - f) Costs to the City resulting from failure of the Contractor to complete the Work within the proper time; or
 - g) Damage to work or property.
- 2) Whenever the City shall, in accordance herewith, withhold any monies otherwise due the

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

H. Final Payment

On the expiration of thirty-five (35) days from the date of acceptance of the contract and filing a Notice of Completion with the Office of the County Recorder, the difference between the final estimate and all payments theretofore made to the Contractor shall be due and payable to the Contractor, subject to any requirements concerning the furnishings of a maintenance bond, and excepting only such sum or sums as may be withheld or deducted in accordance with the material furnished to the City on the located at provisions of this Contract. All prior certifications upon which partial Payments may have been made, being merely estimates, shall be subject to correction in the final certificate.

I. Final Release

Final payment to the Contractor in accordance with the final estimate is contingent upon the Contractor furnishing the City with a signed written release of all claims against the City arising by virtue of the Contract. The Contractor, from the operation of the release, may specifically exclude disputed Contract claims in stated amounts. The release shall be in substantially the following form:

WAIVER AND RELEASE UPON FINAL PAYMENT

The undersigned has been paid in full by the City for all labor, services, equipment and material furnished to the City on the _____ (name of Project) located at _____ and does hereby waive and release the City, its officers, agents, and employees, from all claims and liability to the Contractor arising out of, or in any way connected with, the Contract, except for the disputed contract claims specified below:

Notice of Disputed Claim Amount of Claim

\$ _____

Date

Name, Title

Name of Contractor

J. Waiver of Interest

The City shall have no obligation to pay and the Contractor hereby waives the right to recover interest with regard to monies, which the City is required to withhold by reason of judgment, order, statute or judicial process.

9. Antitrust Claim Assignment

In entering into a public works contract or a subcontract to supply goods, services, or materials pursuant to this contract, the Contractor and all Subcontractors shall offer and agree 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. Sec. 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, services or materials pursuant to the public works contract or subcontract. This assignment shall be made and become effective at the time the City tenders final payment to the Contractor, without further acknowledgement by the parties.

10. Prosecution and Progress

Attention is directed to the provisions of the Standard Specifications for the requirements and conditions concerning the prosecution and progress of the work and the assignment of the contract.

11. Permits and Code

- A. The Contractor shall give all notices required by and comply with all applicable laws, ordinances and codes of the City of Placerville. All construction work and/or utility installations shall comply with all applicable ordinances and codes including all written waivers. Before installing any work, the Contractor shall examine the Drawings and Contract Specifications for compliance with applicable ordinances and codes and shall immediately report any discrepancy to the City Engineer of the City of Placerville. Where requirements of the Drawings and Contract Specifications fail to comply with such applicable ordinances and codes, the City of Placerville will adjust the contract by Change Order to conform to such ordinances and codes (unless waivers in writing covering the differences have been granted by the governing body or department) and make appropriate adjustment in the contract price or stipulated unit prices.

Should the Contractor fail to observe the foregoing provisions and proceed with the construction and/or install any utility variance with any applicable ordinance or Code including any written waivers (not with-standing the fact that such installation is in compliance with the Drawings and Contract Specifications) the Contractor shall remove such work without cost to the City and a Change Order will be issued to cover only the excess cost the Contractor would have been entitled to receive if the change had been made before the Contractor commenced work on the items involved.

- B. The Contractor shall comply with applicable laws and ordinances governing the disposal of surplus excavation, materials, debris and rubbish on or off the project area and commit no trespass on any public or private property in any operation due to or connected with the improvements embraced in this contract.

12. Apprenticeship Requirements

California Labor Section 1777.5 requires in the employment of apprentices in public works contracts:

- A. Only registered apprentices within a written agreement in an approved apprentice-training program providing no less than 2,000 hours of continuous employment and

education are eligible for employment on public works (in compliance with Labor Section 3077).

- B. A contractor is no longer required to submit Form DAS-7, but must submit award information to the local applicable joint apprenticeship committee. The award information must include:

- 1) an estimate of the journeyman hours;
- 2) the number of apprentices to be employed; and
- 3) the approximate dates of apprentice employment.

- C. The minimum statutory 1:5 hourly ratio of work stipulates that no less than one hour of apprentice work for every five hours of journeyman labor on any day of work. (Any journeyman work performed beyond 8 hours per day or 40 hours per week shall not be used to calculate the hourly ratio.)

This section shall not apply to specialty contractors or general contractors whose contracts involve less than Thirty Thousand Dollars (\$30,000.00) or 20 working days.

The Division of Apprenticeship Standards may grant a certificate exempting the contractor from the minimum 1:5 hourly ratio under any one of the following:

- 1) Unemployment exceeds an average of 15% in the area for the previous 3-month period;
- 2) The number of apprentices in training in such area exceeds a ratio of 1:5;
- 3) The apprentice able craft or trade is replacing at least one-thirtieth of its journeymen annually through apprenticeship training, either locally or statewide;
- 4) The specific task would jeopardize the apprentice's life or public safety or no training can be provided to an apprentice by a journeyman for the specific task.

- D. Apprentices employed on public works projects can only be assigned to perform work of the craft or trade to which the apprentice is registered.
- E. All contractors with employees in any apprentice able occupation, regardless of the actual employment of journeymen or apprentices for the awarded public work, must either contribute to the local training trust fund or to the California Apprenticeship Council, P.O. Box 603, San Francisco, CA 94101 (as set forth in Section 227).
- F. Any person who violates Section 1777.5 shall pay a civil penalty of Fifty Dollars (\$50.00) for each calendar day of noncompliance.

Any person who willfully violates Section 1777.5 shall pay the Fifty Dollars (\$50.00) fine for each calendar day of noncompliance and shall be denied the right to bid on, or to receive, any public works contract for a period of up to one year for the first violation and up to three years for any additional violations.

Compliance disputes arising under Section 1777.5 shall be adjudicated under 8

California Code of Regulations, Article 1.

- G. Within five (5) days of a public works contract award, the awarding agency must send a copy of the award to the Division of Apprenticeship Standards under Section 1773.3.

Within five (5) days of finding any discrepancy regarding the hourly ratio of apprentices to journeymen, the awarding agency shall notify the Division of Apprenticeship Standards.

- H. The Contractor shall be responsible for compliance for all requirements for occupations subject to apprenticeships as provided by this Contract and/or applicable law.

13. Subcontracting

Attention is directed to the provisions in Section 5-1.13, "Subcontracting" of the Standard Specifications and these Special Provisions.

Installation of traffic signals shall be considered a "Specialty Item" as defined in Section 7 of the Caltrans Standard Specifications.

In accordance with the requirements of Sections 4100 and 4113, inclusive, of the Public Contract Code, each bidder shall list in his proposal all the names and business address of each subcontractor to whom the bidder proposes to subcontract work and shall list each subcontractor licensed by the State of California. Said list shall include a description of the portion of the work which will be done by each subcontractor.

A sheet for listing the subcontractors, as required, is included in the proposal.

14. Performance of Subcontractors and Suppliers

The Subcontractors and suppliers listed in the Proposal shall perform the work and supply the materials for which they are listed unless the Contractor has received prior written authorization from the Engineer to perform the work with other forces or to obtain the materials from other sources.

Authorization to utilize other forces or sources of materials may be requested for the following reasons:

- A. The listed subcontractor, after having had a reasonable opportunity to do so fail or refuses to execute a written contract, when such written contract, based upon the general terms, conditions, plans and specifications for the project, or on the terms of such subcontractor's or supplier's written bid, is presented by the Contractor.
- B. The listed subcontractor becomes bankrupt or insolvent.
- C. The listed subcontractor fails or refuses to perform his subcontract or furnish the listed materials.
- D. The Contractor stipulated that a bond was condition of executing a subcontract and the listed subcontractor fails or refuses to meet the bond requirements of the Contractors.

- E. The work performed by the listed subcontractor is substantially unsatisfactory and is not in substantial accordance with the plans and specifications, or the subcontractor is substantially delaying or disrupting the progress of the work.
- F. It would be in the best interest of the City.

The Contractor shall not be entitled to any payment for such work or material unless it is performed or supplied by the listed subcontractor or by other forces (including those of the Contractor) pursuant to prior written authorization of the Engineer.

15. Permits and Licenses

Attention is directed to Section 5-1.20B, "Permits, Licenses, Agreements, and Certificates" of the Standard Specifications and these Special Provisions.

The California Environmental Quality Act of 1970 (Chap. 1433, Stats. 1970), as amended by Chapter 1154, Stats. 1972, may be applicable to permits, licenses and other authorizations which the Contractor must obtain from local agencies in connection with performing the work of the contract. The Contractor shall comply with the provisions of said statutes in obtaining such permits, licenses and other authorizations and they shall be obtained in sufficient time to prevent delays to the work.

In the event that the City has obtained permits, licenses or other authorizations, applicable to the work, in conformance with the requirements in said California Environmental Quality Act of 1970, the Contractor shall comply with the provisions of said permits, licenses, and other authorizations.

16. Statistical Testing

Moving average requirements are waived.

17. Highway Construction Equipment

Attention is directed to Sections 7-1.02O, "Vehicle Code" and 5-1.33, "Equipment" of the Standard Specifications and these Special Provisions.

Pursuant to the authority contained in Section 591 of the Vehicle Code, the Department has determined that, within such areas as are within the limits of the project and are open to public traffic, the Contractor shall comply with all of the requirements set forth in Divisions 11, 12, 13, 14, and 15 of the Vehicle Code. Attention is directed to the statements in Section 591 that this section shall not relieve the contractor or any person from the duty of exercising due care. The Contractor shall take all necessary precautions for safe operation of his/her equipment and the protection of the public from injury and damage from such equipment.

18. Equipment Rental Rates

The requirements concerning equipment rental rates in Section 9-1.04D, "Equipment Rental" and Section 9-1.04D(3), "Equipment Not On the Job Site Work and Not Required for the Original- Contract Work", of the Standard Specifications are modified as follows:

The Contractor will be paid for the use of equipment at the rental rates listed for such equipment in the Department of Public Works, Division of Highway's publication Section

9-1.03A (3), "Equipment Not On the Job Site and Not Required for Original-Contract Work" of the Standard Specifications is amended by adding the following:

When extra work, other than work specifically designated as extra work in the plans and specifications, is to be paid for on a Force Account basis and the Engineer determines that such extra work required the Contractor to move on to the work equipment which could not reasonably have been expected to be needed in the performance of the contract, the Engineer may authorize payment for the use of such equipment at equipment rental rates in excess of those listed as applicable for the use of such equipment subject to the following additional conditions:

- A. The Engineer shall specifically approve the necessity for the use of particular equipment on such work.
- B. The Contractor shall establish to the satisfaction of the Engineer that such equipment cannot be obtained from his/her normal equipment source or sources and those of his/her subcontractors.
- C. The Contractor shall establish to the satisfaction of the Engineer that the proposed equipment rental rate for such equipment from his/her proposed source is reasonable and appropriate for the expected period of use.
- D. The Engineer shall approve the equipment source and the equipment rental rate to be paid by the State before the Contractor begins work involving the use of said equipment.

19. Sound Control Requirements

The Contractor shall comply with all local sound control and noise level rules, regulations and ordinances, which apply to any work performed pursuant to the contract.

Each internal combustion engine, used for any purpose on the job or related to the job, shall be equipped with a muffler of a type recommended by the manufacturer. No internal combustion engine shall be operated on the project without said muffler.

The noise level from the Contractor's operations, between the hours of 9:00 p.m. and 7:00 a.m. shall not exceed 50 dBA and between the hours of 7:00 a.m. and 9:00 p.m. shall not exceed 80 dBA at a distance of 50 feet.

Said noise level requirement shall apply to all equipment on the job or related to the job, including but not limited to trucks, transit mixers or transient equipment that may or may not be owned by the Contractor. The use of loud sound signals shall be avoided in favor of light warnings except those required by safety laws for the protection of personnel.

Full compensation for conforming to the requirements of this section shall be considered as included in the prices paid for the various contract items of work involved and no additional compensation will be allowed therefor.

20. Hazardous Waste in Excavation

If the Contractor encounters material in excavation that the contractor has reason to believe

may be hazardous waste as defined by Section 25117 of the Health and Safety Code, the contractor shall immediately so notify the Engineer in writing. Excavation in the immediate area of the suspected hazardous material shall be suspended until the Engineer authorizes it to be resumed. If such suspension delays the current controlling operation, the Contractor shall be granted an extension of time as provided in Section 8-1.10, "Liquidated Damages", of the Standard Specifications.

If such suspension delays the current controlling operation by more than 2 working days, the delay shall be considered a right of way delay and the Contractor shall be compensated for such delay as provided in Section 8-1.07, "Delays", of the Standard Specifications.

The City reserves the right to use other forces for exploratory work to identify and determine the extent of such material and for removing hazardous material from such area.

21. Referenced Specifications

The references to Federal specifications and other specifications for the various materials to be furnished by the Contractor shall include, in addition to the basic specifications referred to, all applicable amendments to the specifications and all emergency alternate specifications which have been promulgated and are in effect on the date bids are received. When more than one reference specification is referred to for a material, the material used shall be the one of the highest grade or standard.

22. Safety

A. General

- 1) The Contractor shall be solely and completely responsible for the conditions of the job Site, including safety of all persons and property during performance of the Work. This requirement shall apply continuously and not be limited to normal working hours. Safety provisions shall conform to all applicable Federal, State, and local laws, ordinances, and codes, and to the rules and regulations established by the California Division of Industrial Safety, and to other rules of law applicable to the Work.
- 2) The services of the Engineer in conducting construction review of the Contractor's performance is not intended to include review of the adequacy of the Contractor's work methods, equipment, bracing or scaffolding or safety measures, in on, or near the construction site, and shall not be construed as supervision of the actual construction nor make the Engineer or the City responsible for providing a safe place for the performance of work by the Contractor, Subcontractors, or suppliers; or for access, visits, use work, travel or occupancy by any person.
- 3) The Contractor shall carefully instruct all personnel working in potentially hazardous work areas as to potential dangers and shall provide such necessary safety equipment and instruction as is necessary to prevent injury to personnel and damage to property. Special care shall be exercised relative to electrical work, work involving excavation and in sump pump work.
- 4) All work and material shall be in strict accordance with all applicable State, Federal and local laws, rules, regulations, and codes

- 5) Nothing in this Contract is to be construed to permit work not conforming to governing law. When Contract Documents differ from governing law, the Contractor shall furnish and install the higher standards called for without extra charge. All equipment furnished shall be grounded and provided with guards and protection as required by safety codes. Where law requires vapor-tight or explosion-proof electrical installation, this shall be provided.
- 6) The Contractor shall submit a safety plan and/or narrative description to the Engineer prior to commencement of the Work. This safety plan and/or narrative description shall describe all first aid, safety clothing, etc. to be used at Project Site.

B. Shoring and Trench Safety Plan

- 1) Attention is directed to Section 832 of the Civil Code of the State of California relating to lateral and subjacent support. The Contractor shall comply with this and other applicable laws including Public Contract Code section 7104.
- 2) **In accordance with Section 6705 of the State Labor Code, the Contractor shall submit to the City specific plans to show details of provisions for worker protection from caving ground. Not less than thirty (30) days before beginning excavation for any trench or trenches five feet or more in depth required under this Contract, the Contractor shall furnish to the Engineer working drawings of its trench safety plan.** The trench safety plan working drawings shall be detailed plans showing the design of the shoring, bracing, sloping or other provisions to be made for worker protection from the hazard of caving ground. If such plan varies from shoring system standards established by the Construction Safety Orders of the California Division of Industrial Safety or the Federal Safety and Health Regulations for Construction of the Occupational Safety and Health Administration, Department of Labor, the plan shall be prepared by a registered civil or structural engineer. In no event shall the Contractor use a shoring, sloping or protective system less than required by the Construction Safety Orders, or less effective than that required by the Federal Safety Standards. Submission of this plan in no way relieves the Contractor from the requirement to maintain safety in all operations performed by itself or its Subcontractors.

23. Warranty Bond

As a condition precedent to the completion of this contract, the Contractor shall furnish in triplicate a bond of a surety company authorized to do business in the State of California acceptable to the owner in an amount of one hundred percent (100%) of the total contract price plus change orders, to hold good for a period of one year after the completion and acceptance of the work, to protect the City against the results of defective materials, work quality and equipment during that time. This bond shall be delivered to the City before the Engineer shall recommend the acceptance of the work to the City Council.

SECTION C – WAGE AND EQUIPMENT RATES

1. Prevailing Wage Rates – In accordance with the provisions of Section 1770 of the Labor Code of the State of California, the Director of the Department of Industrial Relations has determined the general prevailing rate of per diem wages applicable to the work to be done, and a current copy of said prevailing wages is on file with the City Clerk. Should the minimum Federal Wage Rate be higher than the rate determined by the Director of the Department of Industrial Relations, then the Federal Wage Rate Determination shall govern.

The successful bidder will be required to post a copy of these general prevailing rates of per diem wages in a conspicuous place at the job site forthwith upon undertaking the public work called for herein.

In addition, the City of Placerville requires that the Contractor and all his/her Subcontractors shall pay their employees on said work a salary or wage at least equal to the prevailing salary or wage for work of similar character in the locality in which the public work is performed. The Contractor shall, as a penalty, forfeit to the City the amount specified by law for each calendar day or portion thereof, for each employee paid less than the prevailing salary or wage for any public work done under the contract by him/her or any subcontractor under him/her.

The State Labor Code states that for violations of public works laws relating to payment of prevailing wages, the City of Placerville will be required to withhold from any progress payments owed to a contractor any amounts that have been forfeited as penalties, or as wages owed to employees, who have not been paid the prevailing wage for work performed. Effective 1/1/97, the City is required to directly transfer all withheld wages and penalties to the Labor Commissioner for disbursement in those cases where a contractor fails to bring a lawsuit for amounts withheld within 90 days after the completion of the public works contract and formal acceptance of the job by the City.

Also, the Labor Commissioner is permitted to intervene in any lawsuit brought by the contractor against an awarding body for recovery of amounts withheld. In the event that the contract does not prevail in the lawsuit to recover the amounts withheld, the wages and penalties will then be forwarded to the Labor Commissioner for disbursement in the manner previously described.

2. Payroll Record – In accordance with the provisions of Section 1776 of the Labor Code of the State of California, the Contractor 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 the Contractor in connection with this project. This payroll record shall be certified and available for inspection at all reasonable hours at the principal office of the successful bidder and a certified copy shall be furnished within ten (10) days after receipt of a written request by the following parties:
 - A. An employee or his/her authorized representative
 - B. City's representative
 - C. Representative of Labor Standard Enforcement and Division of Apprenticeship
Standard of Department of Industrial Relations

Any copy of the payroll record made available for inspection and furnished to the public through the above entities shall not disclose names, addresses or social security numbers of individual

employees except the name and address of the Contractor.

In the event of non-compliance with the requirement of this subdivision, the Contractor shall have ten (10) days in which to comply subsequent to receipt of written notices from the State or City. If the non-compliance is still evident after the ten-day period, the Contractor shall, as a penalty, forfeit to the City the amount specified by law for each calendar day, for each employee, until strict compliance is effectuated.

3. Equipment Rental Rates – Equipment rental will be paid for as provided under Section 9-1.03A of the State Standard Specifications at the rates listed in the EQUIPMENT RENTAL RATES TABLE of the State of California, Department of Public Works, Division of Highways, latest issue, for use in their Special Provisions, a copy of which Table of Rates is filed in the City Engineer's Office.
4. Employment of Apprentices – The Contractor's attention is directed to California Labor Code sections 1777.5, 1777.6 and 1777.7 pertaining to employment of indentured apprentices, which are hereby incorporated by reference into this Contract. As applicable, the Contractor or any subcontractor employed by it in the performance of the Contract work shall take such actions as necessary to comply with the provisions of sections 1777.5, 1777.6 and 1777.7.
5. Public Works Contractor Registration – In accordance with California Labor Code Section 1771.1(a), a contractor or subcontractor shall not be qualified to bid on, be listed in a bid proposal, subject to the requirements of Section 4104 of the Public Contract Code, or engage in the performance of any contract for public work, as defined in this Division 2, Part 7, Chapter 1 of the Labor Code (commencing with Section 1720), unless currently registered and qualified to perform public work pursuant to Section 1725.5 of the Labor Code. In accordance with Labor Code section 1771.4(a)(1), this project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.

SECTION D – GENERAL CONSTRUCTION DETAILS

1. Scope of Work – For all work on this project the Contractor shall furnish all labor, materials, tools, equipment, transportation, appliances and services required to completely execute the work as set forth on the drawings and in these specifications. The subdivision of these specifications into divisions is not intended to strictly set forth or limit the scope of any subcontractor and shall not relieve the Contractor of the responsibility for executing all work on the project as a whole.
2. Reference – Specific reference is hereby made to the State of California Standard Specifications, Department of Transportation, Division of Highways, current edition; the El Dorado County Community Development Agency, Improvement Standards, current edition.
3. Pre-Construction Conference – The Contractor, City Engineer and other interested parties shall meet at a pre-construction conference to be scheduled after execution of the construction contract and prior to the start of construction. The purpose of this conference is to review job schedules, traffic control, affirmative action, and to discuss various other aspects of the work and to clarify procedures.

The Contractor shall submit the following to the City Engineer by the date of the pre-construction conference:

- A. Detailed Construction Schedule for review and approval.

- B. Detailed Traffic Control Plan for review and approval.
 - C. Erosion and Sediment Control Plan.
 - D. Any other material or required submittals for review and approval. All submittals shall be in writing.
 - E. "Notice" to homeowners and/or affected parties for review and approval.
- 4. Construction Schedule – The proposed construction schedule shall indicate the various subdivisions of work and the date of commencing and finishing of each. The Engineer, prior to the start of work, shall approve the form of the schedule. The schedule shall be considered as advisory to the Engineer of the Contractor's plans for completing the work within the Contract time and shall in no way be construed to operate as an agreement or guarantee by the Engineer, upon the acceptance of its form, of the Contractor's production. The Contractor shall be obligated to complete the work within the Contract time. At the Engineer's discretion, should the work not conform to the Contractor's progress schedule, the Engineer may request in writing a new schedule reflecting the work as currently progressing. The Contractor shall provide the new schedule within one week of the written request.
 - 5. Weekly Statement of Working Days – 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 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. The Contractor will be allowed 15 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.
 - 6. Verification of Conditions – The Contractor shall verify all existing conditions before commencing work. All discrepancies between the drawings and actual field conditions shall be immediately reported to the City Engineer in writing who shall determine if modifications in the work are necessary. The Contractor shall not modify the work without prior authorization from the City.
 - 7. Substitutions – Any substitutions of materials, equipment, construction methods, etc. from those noted in the drawings and specifications must be approved in writing by the City Engineer prior (10 working days) to their use or application or installation in the field.
 - 8. Underground Utilities – In accordance with Government Code section 4215, the Contractor shall be compensated for the costs of locating, repairing damage not due to the failure of the Contractor to exercise reasonable care, and removing or relocating existing main or trunk line utility facilities which are not indicated in the Contract Plans and Specifications with reasonable accuracy, and for the equipment on the Project necessarily idled during such work, provided that the Contractor shall first notify the Engineer before commencing work on locating, repairing damage to, removing or relocating such utilities. Contractor shall not be liable for liquidated damages or delays caused by the removal or relocating of utilities when such removal or relocations is the responsibility of the City or the owner of the utility pursuant to Government Code Section 4215.
 - 9. Materials and Tests – All materials incorporated in the project shall meet the requirements of tests specified in the Standard Specifications and other minimum requirements specified herein or in these special provisions. Attention is directed to Section 6 of the Caltrans

Standard Specifications.

The Contractor shall furnish written laboratory reports from a reputable testing or inspection agency, or written certification from the manufacturer as to compliance with the Specifications as to the composition, durability and performance of the all materials used in the project. Certain specification sections may require special items or materials to be included in the submittal. Reference is made to the Contract Specifications for specific instructions.

These reports on any material must be submitted to the Engineer in writing and approved by the Engineer before incorporating that material in the work. All material shall be adequately identified by tags or other means as that material which has been tested and approved. Lack of proper identification shall be considered adequate cause for rejection of any material which cannot be properly inspected on the job.

The City reserves the right to make such additional inspections or tests as it may require prior to acceptance of any materials, and also reserves the right to reject any material previously approved because of serious defects or damage discovered subsequent to such approval. Any material rejected by the City shall immediately be removed from the job site, and no payment will be allowed therefor.

The Contractor shall bear the expense for all unsatisfactory tests and deductions will be made from any moneys due or to become due the Contractor, sufficient to cover the cost of the tests.

Full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved for testing and sampling of material from any source shall be considered as included in the price paid for the contract item of work involving such material and no additional compensation will be allowed therefor.

10. City Furnished Materials – The City will furnish to the Contractor free of charge for use under these Specifications the materials specified as “City Furnished” in the Contract Specifications. Contractor shall furnish all other materials called for under this contract.
11. Sequence of Constructing to Maintain Traffic – Attention is directed to the Work Sequencing section of the Caltrans Standard Specifications. Restriction of parking on the street will be permitted only when authorized by the Engineer.

The Contractor must submit a detailed schedule of operations to the City for its review and approval prior to starting work on the project to enable the City Engineer to ascertain that the intent of Section 10 of the Standard Specifications is being complied with and followed.

12. Obstructions – Attention is directed to the presence of water, fire alarms, telephone, sewer, drainage, gas lines, overhead utilities and underground power lines in the construction area.

The work shall be conducted as to permit utility companies to maintain their services without interruption.

Minor adjustments of pole lines, pipe lines, and other public improvements may be undertaken by the owners of these improvements during the progress of the work. The Contractor shall cooperate with the owners of the improvements during the progress of the work. The Contractor shall cooperate with the owners of the improvements and shall so coordinate his work as to avoid damage to any of these improvements.

Abandoned utility pipe lines and conduits, if encountered, shall be removed and disposed

of off the job site by the contractor in accordance with the requirements of the Caltrans Standard Specifications.

Full compensation for conforming to the requirements of this Section not otherwise provided for, shall be considered as included in the prices paid for the various contract items or work, and no additional allowance will be made therefor.

13. Contractor's Responsibility – The Contractor shall be completely responsible for the care and condition of the project improvements in their entirety until completion of the maintenance period and acceptance by the City. The Contractor shall provide all watchmen, guards, and security devices, as he/she deems necessary. Also, the Contractor and all employees of the Contractor shall obey all applicable laws and City ordinances while performing work under this contract. Any fines assessed to the Contractor and all employees for not obeying the laws and ordinances of this City while performing work under this contract shall be the responsibility of the Contractor or employees to pay.
14. Construction Upon Private Property – The Contractor shall note that the work may be performed on or in the vicinity of private property. The Contractor shall, at all times, remove all litter, debris, and construction waste, minimize noise, dust, standing water, vibrations, hazardous conditions and provide safe access to these properties. The Contractor is prohibited from using any and all privately owned utilities. The Contractor's materials and equipment shall not be stored upon private property without written approval from the resident and/or owner.

Construction on private property during overtime, weekend, holiday or any other irregular period shall be performed only when the Contractor has requested and received written approval from the adjacent residents and the City Engineer.

Contractor's attention is directed to Section 6-21, "Preservation of Property," of the El Dorado County Standard Construction Specifications. The Contractor shall protect all on-site private improvements, not indicated for removal, from damage. On-site private improvements include but are not limited to trees, shrubbery, ground cover, structures, gates, fences, signs, utility facilities, and drainage facilities. If such objects are damaged, they shall be replaced, repaired and/or restored to a condition equal or better than when the Contractor entered upon the work, as determined by the Engineer. Any damaged materials deemed unsuitable by the Engineer shall become the property of the Contractor and shall be disposed of off the right of way, unless permitted by the City to be disposed of on the work site.

Existing trees, shrubs and other plants, that are not to be removed as shown on the plans or specified elsewhere in these special provisions, and are injured or damaged by reason of the Contractor's operations, shall be replaced by the Contractor. Replacement planting shall conform to the requirements in Section 20-4, "Plant Establishment Work," of the State Standard Specifications.

No separate payment shall be made for the above considerations. Full compensation for the above construction restrictions shall be considered as included in the price paid for the various items of work involved.

15. As-Built Drawings – Maintenance and submittal of Record Drawings by the Contractor shall be in accordance with Section 11-3 Record Drawings of the El Dorado County Standard Construction Specifications.

*****END OF SECTION*****



CITY OF PLACERVILLE, CALIFORNIA\
DEVELOPMENT SERVICES DEPARTMENT
ENGINEERING DIVISION

Madrone and Giovanni Sewer Lift Stations Rehabilitation Project

Project No. 40330

GENERAL REQUIREMENTS

**SECTION 01090
REGULATORY REQUIREMENTS AND PERMITS**

1.0 APPLICABLE CODES

See Technical Specifications for Applicable Codes.

2.0 FEES AND PERMITS

2.1 Summary

Contractor shall comply with all the terms, conditions and requirements attached to all permits, bonds and licenses required by any local, state, or federal agencies to perform work, construct, erect, test and start up of any equipment or facility for this Contract. The Contractor shall give all notices necessary and incidental to the due and lawful prosecution of the Work.

Any permits, bonds, licenses and fees therefore required for the performance of work under this Contract and not specifically mentioned herein as being obtained and paid for by the City shall be included in the Contractor's Bid price. The Contractor shall apply for and obtain all safety permits for excavations, tunneling, trenches, construction (building structure, scaffolding, or falsework) and demolition required by CAL/OSHA.

The Contractor shall post at the site of Work all required permits as stipulated by the respective regulatory agency.

2.2 Local Agency and Building Code Fees and Permits

The City is not responsible for any local agency or utility permits required for temporary facilities during construction such as field office trailers and temporary electrical service for construction operations. Obtaining all such permits and the costs associated with such permits are the responsibility of the Contractor and shall be included in the Contractor's Bid Price.

2.3 Encroachment Permit

The contractor is made aware that the project will require the Contractor to apply for a City encroachment permit. Fees will be waived; however, all conditions of the permit will apply.

2.4 Construction Water

Contractor must obtain a water use permit for construction water from the City of Placerville, and be responsible for obtaining a construction meter from the City and paying the construction meter deposit fee of one thousand twenty-five dollars (\$1,025). The monthly rental fee and usage fee will be waived provided the contractor at the City's opinion, utilizes the construction water beneficially and for the sole purpose of the project.

3.0 STORM WATER QUALITY CONTROLS

3.1 General

The 1972 amendments to the Federal Water Pollution Control Act established the National Pollutant Discharge Elimination System (NPDES) permit program to control discharges of pollutants from point sources. The 1987 amendments to the Clean Water Act (CWA) created a new section of the CWA devoted to storm water permitting (Section 402(p)). The EPA has delegated permitting authority to the State Water Resources Control Board (SWRCB). The SWRCB issues both general and individual permits. Construction activities are regulated under the NPDES General Permit for Storm Water Discharges Associated with Construction Activity (General Permit) provided the total amount of ground disturbance during construction is greater than or equal to 1 (one) acre. The appropriate Regional Water Quality Control Board (RWQCB) enforces the General Permit. Coverage under a General Permit requires the submission of a Notice of Intent (NOI) with the appropriate fee, annual compliance reports, a Notice of Termination (NOT) and preparation of a storm water pollution prevention plan (SWPPP).

Construction activity includes, but is not limited to: clearing, grading, demolition, and excavation, construction of new structures, pipelines and reconstruction of existing facilities involving removal and replacement that results in soil disturbance. This includes construction access roads, staging areas, storage areas, stockpiles, and any off-site areas which receive run-off from the construction project such as discharge points into a receiving water.

If a violation of the permit is due to the Contractor's actions or inactions and a fine is assessed, the Contractor shall be responsible for the fine.

3.2 Projects Disturbing Less Than 1-Acre

This project has been determined by the City to disturb less than 1-acre; therefore, a NOI, SWPPP, and NOT are not required. The Contractor shall comply with the following requirements for projects disturbing less than 1-acre.

3.2.1 General – the Contractor shall perform water pollution control work in conformance with the requirements in the Section 303 of the Clean Water Act, the Water Quality Control Plan for the Sacramento River Basin (Central Valley Regional Water Control Board 1998) and in the El Dorado County Stormwater Quality Ordinance.

Before the start of job site activities, the Contractor shall provide training for project managers, supervisory personnel, and employees involved with water pollution control work. The training shall include:

- A. Rules and regulation
- B. Implementation and maintenance for:
 - 1. Temporary Soil Stabilization
 - 2. Temporary Sediment Control
 - 3. Tracking Control
 - 4. Wind Erosion Control

The Contractor shall designate in writing a Water Pollution Control Manager (WPCM). The Contractor shall submit a statement of qualifications describing the training, work history, and expertise of the proposed WPCM. The qualifications shall include either:

- A. Must have attended State Water Resources Control Board sponsored or approved Qualified SWPPP Practitioner training as described at State Water Resources Control Board web site.
- B. Certification as a Certified Professional in Erosion and Sediment Control (CPESC).

The WPCM shall be:

- A. Responsible for water pollution control work.
- B. The primary contact for water pollution control work.
- C. Have authority to mobilize crews to make immediate repairs to water pollution control practices.

The Contractor may designate one manager to prepare the Water Pollution Control Program (WPCP) and a different manager to implement the plan. The WPCP preparer shall meet the training requirements for the WPCM.

3.2.2 Water Pollution Control Program – The Contractor shall submit a Water Pollution Control Program (WPCP) to the City for approval. The WPCP shall conform to the requirements in the Clean Water Act and these special provisions.

The WPCP shall include water pollution control practices:

- A. For storm water and non-storm water from areas outside of the job site related to construction activities for the contract such as:
 - 1. Staging areas
 - 2. Storage yards
 - 3. Access roads
- B. Appropriate for each season as described in “Implementation Requirements” of these special provisions.

The WPCP shall include a schedule that:

- A. Describes when work activities that could cause water pollution will be performed.
- B. Identifies soil stabilization and sediment control practices for disturbed soil area.
- C. Includes dates when these practices will be 25, 50, and 100 percent complete.
- D. Shows 100 percent completion of these practices before the rainy season.

The WPCP shall include the following water pollution control practices and their associated contract items of work as shown on the plans or specified in these special provisions:

- A. Temporary Soil Stabilization
- B. Temporary Sediment Control
- C. Tracking Control
 - 1. Stabilized Construction Entrance/Exit
- D. Wind Erosion Control
- E. Non-Storm Water Management
- F. Waste Management and Materials Pollution Control
 - 1. Concrete Waste Management

G. Final Stabilization Measures

Within 5 days after contract approval, the Contractor shall submit 2 copies of the WPCP to the City. The Contractor shall allow 5 days for the City's review. If revisions are required, the City will provide comments and specify the date that the review stopped. The Contractor shall revise and resubmit the WPCP within 5 days of receipt of the City's comments. The City's review will resume when the complete WPCP is resubmitted. When the City approves the WPCP, the Contractor shall submit 3 copies of the approved WPCP to the City. The Contractor may proceed with construction activities if the City conditionally approves the WPCP while minor revisions are being completed.

The Contractor shall not perform work that may cause water pollution until the WPCP has been approved by the City. The City's review and approval shall not waive any contract requirements and shall not relieve the Contractor from complying with Federal, State and local laws, regulations, and requirements.

If there is a change in construction schedule or activities, the Contractor shall prepare and amendment to the WPCP to identify additional or revised water pollution control practices. The Contractor shall submit the amendment to the City for review within a time agreed to by the City not to exceed the number of days specified for the initial submittal of the WPCP. The City will review the amendment within the same time allotted for the review of the initial submittal of the WPCP.

If directed by the City or requested in writing by the Contractor and approved by the City, changes to the water pollution control work specified in these special provisions will be allowed. Changes may include addition of new water pollution control practices. The Contractor shall incorporate these changes in the WPCP. No additional compensation will be made by the City for modifications and/or additions to the WPCP.

The Contractor shall keep a copy of the approved WPCP at the job site. The WPCP shall be made available when requested by a representative of the Regional Water Quality Control Board, State Water Resources Control Board, United States Environmental Protection Agency, or the local storm water management agency. Requests from the public shall be directed to the City.

3.2.3 Implementation Requirements – The Contractor's responsibility for WPCP implementation shall continue throughout any temporary suspension of work ordered in conformance with the provisions in Standard Specifications 13-2.

If the Contractor or the City identifies a deficiency in the implementation of the approved WPCP, the deficiency shall be corrected immediately, unless an agreed date for correction is approved in writing by the City. The deficiency shall be corrected before the onset of precipitation. If the Contractor fails to correct the deficiency by the agreed date or before the onset of precipitation, the Department may correct the deficiency and deduct the cost of correcting deficiencies from payments.

3.2.3.1 Year Round – The Contractor shall monitor the National Weather Service weather forecast on a daily basis during the contract. The Contractor may use an alternative weather forecasting service if approved by the City. Appropriate water pollution control practices shall be in place before precipitation.

The Contractor may discontinue earthwork operations for a disturbed area for up to 21 days and the disturbed soil area will still be considered active. When earthwork operations in the disturbed area have been completed, the Contractor shall implement appropriate water pollution control practices within 15 days or before predicted precipitation, whichever occurs first.

3.2.3.2 Rainy Season – Soil stabilization and sediment control practices conforming to these special provisions shall be in place during the rainy season between October 15 and April 15.

The Contractor shall implement soil stabilization and sediment control practices a minimum of 10 days before the start of the rainy season.

3.2.4 Inspection and Maintenance – The WPCM shall inspect the water pollution control practices identified in the WPCP as follows:

- A. Before a forecasted storm,
- B. After precipitation that causes site runoff,
- C. At 24-hour intervals during extended precipitation,
- D. On a predetermined schedule, a minimum of once every 2 weeks outside of the defined rainy season, and
- E. On a predetermined schedule, a minimum of once a week during the defined rainy season.

The WPCM shall oversee the maintenance of the water pollution control practices.

The WPCM shall use the Storm Water Quality Construction Site Inspection Checklist provided in the Preparation Manual or an alternative inspection checklist provided by the City. A copy of the completed site inspection checklist shall be submitted to the City within 24 hours of finishing the inspection.

3.2.5 Reporting Requirements – If the Contractor identifies discharges into surface waters or drainage systems causing or potentially causing pollution or if the project receives a written notice or order from a regulatory agency, the Contractor shall immediately inform the City. The Contractor shall submit a written report to the City within 7 days of the discharge, notice, or order. The report shall include the following information:

- A. The date, time, location, and nature of the operation, type of discharge and quantity, and the cause of the notice or order.
- B. The water pollution control practices used before the discharge, or before receiving the notice or order.
- C. The date of placement and type of additional or altered water pollution control practices placed after the discharge or after receiving the notice or order.
- D. A maintenance schedule for affected water pollution control practices.

4.0 DEWATERING

Construction dewatering in El Dorado County is regulated by the California Regional Water Quality Control Board- Central Valley Region. In May of 2013, the Central Valley Region adopted Waste Discharge Requirements Order No. r5-2013-0074 and National

Pollutant Discharge Elimination System (NPDES) Permit No. CAG995001 to regulate construction dewatering. Should the Contractor need to control groundwater by dewatering, depressurization of water bearing soil and rock formations, dispose of testing/flushing water and/or dewater the pipeline for abandonments or tie-in purposes the Contractor must apply for coverage under and comply with this NPDES Permit, or any updated NPDES Permit, and all other laws and regulations having jurisdiction over construction dewatering. The Contractor is responsible for obtaining all permits from agencies with control over all dewatering matters including well installation/abandonment, water discharge, use of existing storm drains and natural water sources. Contractor can download a complete copy of Order No. r5-2013-0074 on the internet site:

http://www.waterboards.ca.gov/centralvalley/board_decisions/adopted_orders/general_orders/r5-2013-0074.pdf

The Contractor will be held responsible for any fines or penalties from regulatory agencies resulting from its dewatering system.

Before dewatering is commenced, the Contractor shall obtain acceptance of the City Representative for the method, installation, monitoring, testing, removal, discharge point(s) and other system details of the Contractor's proposed dewatering system. To that end, the Contractor is to submit to the City Representative a complete dewatering plan prepared and signed by a Professional Engineer registered in California.

*****END OF SECTION*****

SECTION 01140 WORK RESTRICTIONS

1.0 GENERAL SEQUENCING AND CONSTRAINTS

- A. Work Sequence and Constraints described hereinafter are critical events in work sequence which are presented to underscore the importance of proper sequencing, scheduling and coordination. The work sequence and constraints presented do not describe all items affecting the completion of the Work, but are intended to describe important events necessary to minimize disruption of the existing facilities.

2.0 INTERRUPTION OF SERVICE

2.1 Work Impacts

- A. The Contractor shall keep the existing sewer lift station on line while the new station is being constructed or provide a bypass system to maintain service. If a bypass is proposed the Contractor shall submit the details of the system for final approval by the Engineer and City.
- B. All costs associated with keeping the existing system in service shall be included in the items of work. No additional compensation will be allowed.
- C. A limited shutdown will be allowed during cross over from the new system to the existing system. The Contractor shall coordinate all requirements for the shutdown with City operations staff.

3.0 WORK MILESTONE

Work on Giovanni Lift Station shall be started as first priority. Other project milestones shall be as listed below.

Contractual Completion Event**Completion Time (# of working days
from commencement)**

Milestone #1 – Completion of all lift station and site improvements at Giovanni Sewer Lift Station, including testing and all surface restoration.

90 working days

Milestone #1 – Completion of all lift station and site improvements at Madrone Sewer Lift Station, including testing and all surface restoration

120 working days

Substantial Completion – Old facilities abandoned or removed (per plan and specifications) and new facilities in use. Pavement Restoration completed.

130 working days

Final Completion

140 working days

4.0 OTHER WORK RESTRICTIONS AND COORDINATION REQUIREMENTS**4.1 Existing Utilities**

- A. A minimum of 48 hours in advance of excavation activities, the Contractor shall contact the following parties to ascertain and verify the existence and location of utility lines and facilities and shall coordinate all work in accordance with the information obtained from such inquiries in order to prevent damage to such lines and facilities:

Underground Service Alert (USA) (1-800-642-2444)

Prior to conducting any excavation, the Contractor shall contact the appropriate regional notification center as required by Government Code Section 4216.

All sewer crossings shall conform to the State Health Department regulations for water/sewer separation and materials. Cost for special pipeline materials to meet Health Department regulations, and repair of services damaged shall be included in the cost of the bid items to which the work is appurtenant. No separate payment will be made. City

The Engineer or his representative has endeavored to determine the existence of utilities at the work site from the records of the City's of known utilities in the vicinity of the work. The positions of these utilities, as derived from such records, are shown on the Plans. The service connections to these utilities may not be shown on the Plans.

The Contractor shall make his own investigations, including exploratory excavations and utility potholing, to determine the locations and type of existing service laterals or appurtenances when their presence can be inferred from the presence of other visible facilities, such as buildings, meters and junction boxes, on or adjacent to the work site.

*****END OF SECTION*****

**SECTION 01160
FIELD ENGINEERING**

1.0 DATUM

- A. Vertical and horizontal datum are based on the coordinates and benchmarks shown on the contract documents or as provided by City prior to the start of construction. The Contractor is to locate and protect any City furnished control points prior to starting the Work and preserve control points during construction. The Contractor shall re-establish all control points disturbed by its operations at no cost to City.
- B. The Contractor shall establish other vertical and horizontal control from these City furnished reference points as required to properly layout and construct the Work. All connections shall be installed based on actual elevations of existing structures to which connections are made.
- C. The Contractor's layout shall be based upon existing structures and the vertical and horizontal datum established by the City.
- D. The Contractor shall be responsible for the preservation of all existing survey monuments, stake, or permanent bench marks. Any monuments or bench marks disturbed or destroyed by Contractor shall be referenced and replaced by a licensed land surveyor. A corner record or record of survey, as appropriate, shall be filed by the licensed land surveyor as required by the Land Surveyor's Act with the appropriate local government agencies.

2.0 PROJECT SURVEY REQUIREMENTS

- A. The Contractor is required to place stakes and marks as described under Chapter 12, "Construction Surveys", of the Caltrans Surveys Manual. The Contractor's Surveyor shall be a land surveyor registered in California or civil engineer qualified and licensed in California with at least five (5) years surveying experience of similar projects.
- B. Dimensions for all existing structures, piping, paving, and other nonstructural items are taken from the available information during the City's planning and design. The Contractor shall field verify all dimensions and conditions in advance of any construction in the area. Any discrepancy between the field survey by the Contractor and the information indicated in the Contract Documents shall be immediately brought to Construction Manager's attention by written notification. In all questions arising as to proper location of lines and grades, the Construction Manager's decision will be final.
- C. Accuracy of the Contractor's stakes, alignments and grades may be periodically and randomly checked by the Construction Manager. If requested by Construction Manager, the Contractor shall supply field labor as required, at no extra charge to City, to aid and assist the Construction Manager in checking location and grades of the work as set by the Contractor. This shall include postponing parts of the Work affected by survey check, moving materials and equipment that interfere with a clear

line of sight between horizontal control points and the construction work. The Contractor is not to assume that Construction Manager's check substitutes or complements the Contractor's required field quality control procedures.

3.0 SUBMITTALS

- A. Contractor to furnish Construction Manager one copy of all land surveyor notes, calculations, sketches and drawings within 48 hours after completion of each survey task.

*****END OF SECTION*****

**SECTION 01200
MEASUREMENT AND PAYMENT**

1.0 MEASUREMENT AND PAYMENT

Attention is directed to Section 00700 Special Provisions regarding Measurement and Payment. Bid item descriptions apply to both the base and alternate bid items.

2.0 DESCRIPTION OF BID ITEMS

ITEM 1 – MOBILIZATION/DEMOBILIZATION

Payment for mobilization shall be at the lump sum price bid and shall include mobilization and demobilization, and all costs related to the use, security, maintenance and restoration of the designated contractor staging area. 40 percent shall be paid with the first pay request. The remaining 60 percent shall be paid with the last pay request upon completion of the project, including site restoration and cleanup of all staging areas. No more than 10% of the total bid will be allowed for this item.

ITEM 2 – SITE SAFETY/TRAFFIC CONTROL PLAN

Payment for project safety and the traffic control plan shall be at the lump sum price bid.

The traffic control plan shall include all tools, equipment, materials and labor necessary to provide and implement a traffic control plan in compliance with the City of Placerville encroachment permit standards as approved by the City. This includes all signage, flaggers, signal control, barricades, cones, K-rail concrete barriers, etc. used in the implementation of the traffic control plan. The contractor is responsible for development, approval and implementation of a traffic control plan. This also includes all costs for any additional project identification signs required by City of Placerville. If road closures are implemented this will also include all time and materials required to coordinate with the City of Placerville Police and Fire Department.

Project site safety shall include providing a detailed plan of worker safety and maintaining safety during construction, including conforming to Labor Code Sections 6700-6708, all applicable safety orders and permits.

ITEM 3 – POTHOLING EXISTING FACILITIES

Measurement and Payment shall be at the lump sum and includes all labor, equipment and materials for potholing existing facilities within the limits of work including but not limited to equipment, labor, materials, locating equipment and all other appurtenances as necessary to complete this work.

Potholing must be completed a minimum of 1 week prior to working in any given area and all data must be provided to the Engineer prior to the start of that work.

No additional compensation will be provided for a utility located within the standard limits of a USA marking.

ITEM 4 – CLEARING AND GRUBBING

Measurement and Payment shall be at the lump sum bid price and shall include removal of all debris and materials that are in conflict with the proposed project including, but not limited to, providing labor, materials, equipment and all other appurtenances to remove, haul-off and

dispose of pavement, concrete, vaults, excess spoil materials, wood, landscape materials, building materials, piping and piping materials.

The Contractor shall remove all unknown underground structures or debris that may be encountered within the limits of construction. Contractor shall bear all cost of disposing of trees, stumps, brush, roots, limbs, concrete, pavement, soil and landscaping materials and other waste materials from the clearing and grubbing operation. Debris shall be disposed of in such a manner as to meet all requirements of State, County and local regulations regarding health, safety and public welfare and shall be properly disposed of off-site. Burning of debris is not permissible and shall not be allowed.

ITEM 5 – DEMOLITION AND ABANDONMENT

Measurement and Payment shall be at the lump sum bid price and shall include but not limited to, equipment, labor and materials for abandonment of existing facilities as shown on the contract drawings

By Lump Sum. Includes demolition, dismantling and removal of the sections of the existing structures and pipelines necessary for abandonment, and visible appurtenances such as, but not limited to, pipe, structures, fittings, valves, and valve boxes. Contractor is responsible for determining size and fittings required for any abandonments. This item also includes demolition and removal of structures, pavement sections and capping ends of pressurized and non-pressurized pipe. All demolished materials described above shall be removed from the site by the Contractor with the exception of items to be salvaged for the City. Salvaged items to be returned and delivered to the City.

Includes costs for preparation of an abandonment plan for City approval. Also includes all costs associated with any temporary tie-ins or abandonments necessary to keep pipelines and services active during construction. The Contractor is responsible for determining the final abandonment sequencing and including all costs in their bid for any temporary and permanent facilities necessary to execute the abandonment plan.

The Contractor is responsible to review each abandonment location to determine the fittings and pipe requirements to adequately abandon the existing pipeline and keep existing lines in service. The plans provide locations of pipelines to be abandoned and pipelines to remain in service.

Contractor shall submit a detailed demolition and abandonment plan for approval by the City. The existing lift stations and pipelines shall be kept in service or service otherwise provided during construction of the new facilities.

ITEM 6 – CONNECTION TO EXISTING SYSTEM

Measurement and Payment shall be at the lump sum bid price and shall include installation of the necessary connections for interim and ultimate conditions to the existing sewer main including, but not limited to, equipment, materials, labor and all other appurtenances as necessary to complete this work including tees, valves, reducers, miscellaneous piping, fittings, nut, bolt and gasket sets, valve box, valve riser, ductile iron spools, flex couplings, gripper rings, restraint fittings, locating wire, trenching, bedding, pipe laying, thrust blocking, backfilling, compacting, compaction testing, controlled low-strength material backfill (CLSM), concrete or other import, structural section replacement, temporary and permanent asphalt replacement, landscaping restoration or concrete replacement due to construction activities, complete and in place.

ITEM 7 – NEW SEWER PIPELINE

Measurement and Payment shall be Full Compensation By the Lump Sum. Includes but not limited to, equipment, labor and materials for furnishing and installation of new sewer pipe (sizes shown on the plans), fabrication, freighting, fittings, placement, excavation, bedding, backfilling, compacting of backfill, dewatering, flushing and testing, temporary and permanent surface pavement repair and striping, landscaping, site restoration, concrete sidewalk/gutter repair, and all incidental work in the installation of the pipeline complete and in place and no additional compensation will be allowed therefore.

ITEM 8 – SEWER WET-WELL AND PUMP IMPROVEMENTS

Measurement and Payment shall be at the lump sum bid price and shall include but not limited to, equipment, labor and materials for furnishing and installation of all necessary piping, connections, coatings, structures (including wet-well), submersible sewer pumps, reinforced concrete pad, tees, reducers, elbows, fittings, restraints, drains, vents, locating wire, nuts, bolts, gaskets, placement, excavation, bedding, backfilling, compacting of backfill, dewatering, thrust blocking, flushing and testing, temporary and permanent pavement, concrete replacement, landscaping, site restoration and all incidental work in the installation of the sewer lift station complete and in place and no additional compensation will be allowed therefore. Attention is directed to Section 9-1.16B Schedule of Values per the State Standard Specifications

ITEM 9 – SITE DRAINAGE IMPROVEMENTS

Measurement and Payment shall be at the lump sum bid price and shall include but not limited equipment, labor and materials for furnishing and installation of site drainage improvements including grading and installation of drainage pipes, connections, inlets, etc. as shown on the plans and no additional compensation will be allowed therefore. Attention is directed to Section 9-1.16B Schedule of Values per the State Standard Specifications

ITEM 10 – SITE ELECTRICAL

Measurement and Payment shall be at the lump sum bid price and shall include but not limited equipment, labor and materials for furnishing, installation and testing of all electrical equipment and programming per the contract plans (electrical sheets) and as defined in the contract technical specifications Division 16 - Electrical. Attention is directed to Section 9-1.16B Schedule of Values per the State Standard Specifications.

ITEM 11 – MISCELLANEOUS SITE IMPROVEMENTS

Measurement and Payment shall be at the lump sum bid price and shall include but not limited equipment, labor and materials for completing any miscellaneous site improvements and restoration not captured in the other bid items.

ITEM 12 – SUPPLEMENTAL WORK

Paid by Supplemental Work Orders issued against a maximum amount shown as a Lump Sum on the Bid Schedule. The amount of the expenditure under this item may vary from zero to the total amount shown on the Bid Schedule and is not guaranteed to the Contractor. The amount of expenditure under this Item may constitute the sum of several modifications. Work to conform to these Contract Documents.

This Item has been included in the Contract to cover modifications to the work necessitated by field conditions. The Engineer will issue a Supplementary Work Order to the Contractor when a portion of the work being performed will be paid under this item. This item is included under the base bid; however, it may also be applied to the alternate bid items as needed.

3.0 OPTIONAL BID ITEMS – Not used

4.0 CONTRACTOR'S COST BREAKDOWN

- A. For work to be performed for a lump sum amount, the Contractor shall submit a cost breakdown to the City Representative prior to the first payment and within ten (10) days after Notice of Award. The cost breakdown, as agreed upon by the Contractor and the City Representative, shall be used for preparing future estimates for partial payments to the Contractor, and shall list the major items of work with a price fairly apportioned to each item.

The cost breakdown shall be generally in the same format as the Contract specifications divisions and subdivisions, with major items of work listed individually. The cost breakdown shall be by structure, civil, landscaping, or other logical division of work. The cost breakdown for architectural, structural, mechanical, and electrical work shall include separate items for identifiable portions of the structures. The cost breakdown shall include separate allowances for any testing and startup work required. Measurable approximate quantities of work performed by the Contractor or its subcontractors shall be provided. For quantities that are the sum total of several individual quantities, backup summaries shall be provided which list the individual descriptions and quantities. These summaries then will be used to determine the quantities of work in place in subsequent progress payment requests.

The above is a statement of the intent of the Contract Documents to provide a high level of detail, acceptable to the City Representative, to allow a fair and reasonable estimate to be made of the value of work installed. The detail of the cost breakdown must be sufficient to provide timely processing of the monthly progress payment request.

The cost breakdown will be subject to the approval of the City Representative, and upon request, the Contractor shall substantiate the price for any or all items and provide additional level of detail, including quantities of work. The cost breakdown shall be sufficiently detailed to permit its use by the City Representative as one of the bases for evaluating requests for payments. The City Representative shall be the sole judge of the adequacy of the cost breakdown.

The cost breakdown shall be solely used to determine progress payments. The cost breakdown shall not be considered in determining payment or credit for additional or deleted work.

*****END OF SECTION*****

SECTION 01330 SUBMITTAL PROCEDURES

1.0 GENERAL

- A. Where required by the Contract Documents, the Contractor shall submit descriptive information that will enable determination of whether the Contractor's proposed materials, equipment, or methods of work are in general conformance to the design concept and in compliance with the Contract Documents. The information to be submitted shall consist of drawings, specifications, descriptive data, certificates, samples, test results and such other information, all as specifically required in the specifications. In some instances, specified submittal information describes some, but not all, features of the material equipment, or method of work. Features not requiring submittals shall be as specified.
- B. Submittal review shall be only for general conformance with the design concept and general compliance with the information given in the contract documents. It shall not include review of quantities, dimensions, weights or gages, fabrication processes, construction safety precautions, all of which are the sole responsibility of the Contractor. Review of a specific item shall not indicate acceptance of an assembly of which the item is a component. The Construction Manager and/or Engineer shall not be required to review and shall not be responsible for any deviations from the contract documents not clearly denoted by the Contractor, nor shall the Construction Manager and/or Engineer be required to review partial submissions or those for which submissions for correlated items have not been received.
- C. The Contractor may authorize material or equipment suppliers to deal directly with the Construction Manager with regard to such submittals; however, ultimate responsibility for the accuracy and completeness of the information contained in the submittal shall remain with the Contractor.

2.0 CONTRACTOR RESPONSIBILITIES

- A. The Contractor shall be responsible for the accuracy and completeness of the information contained in each submittal and shall assure that the materials and equipment incorporated into the Work, or the methods of performing the Work shall be as described in the accepted submittals.
- B. The Contractor shall verify that all features of all products conform to the specified requirements. Submittal documents shall be clearly edited to indicate only those items, models, or series of equipment that are being submitted for review. All extraneous materials shall be crossed out or otherwise obliterated.
- C. The Contractor shall ensure that there is no conflict with other submittals and notify the Construction Manager in each case where his submittal may affect the work of another contractor or the City. The Contractor shall coordinate submittals among its subcontractors and suppliers including those submittals complying with unit responsibility requirements specified in applicable technical sections.

- D. The Contractor shall coordinate submittals with the work so that work will not be delayed. He shall coordinate and schedule different categories of submittals, so that one will not be delayed for lack of coordination with another. No extension of time will be allowed because of failure to properly schedule submittals. The Contractor shall not proceed with work related to a submittal until the submittal process is complete. This requires that submittals for review and comment shall be returned to the Contractor stamped "No Exceptions Taken" or "Make Corrections Noted." The Contractor assumes the risk of expense and delays when proceeding with work that hasn't met this requirement.
- E. The Contractor shall certify on each submittal document that it has reviewed the submittal, verified field conditions, and complied with the contract documents.
- F. The Contractor shall include a copy of the applicable specification section, with addendums and all referenced sections included with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from the specification requirements. Check Marks (✓) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. The submittal shall be accompanied by a detailed, written justification for each deviation. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal.

3.0 SUBMITTAL AND MATERIAL LIST

- A. Within fifteen (15) days after the Notice to Proceed, and prior to the submission of the initial shop drawings, the Contractor shall submit a draft Master Submittal List of all required submittals to the Construction Manager for favorable review. The Master Submittal List shall include a description of each item, Specification reference and the anticipated submittal date. The List shall include all items of equipment and materials for architectural, structural, mechanical, piping, electrical, heating and ventilating, equipment piping, and plumbing work; and the names of manufacturers with whom purchase orders have been placed. Items on the List shall be arranged in the same order as in these Specifications, and shall contain sufficient data to identify precisely the items of material and equipment the Contractor proposes to furnish. The List shall reference the applicable Specification section or Drawing. After the submission is favorably reviewed and returned to the Contractor by the Construction Manager, it shall become the basis for the submission of detailed manufacturer's drawings, catalog cuts, curves, diagrams, schematics, data, and information on each separate item for review. No work shall proceed on any item until it has been submitted and favorably reviewed. An incomplete submittal list is not a basis for avoiding a submittal required by the specifications.
- B. Contractor shall submit a cash flow projection for the complete project along with their overall project schedule. Cash flow projections shall be updated with each monthly pay submittal at a minimum.

4.0 DEFINITIONS

- A. Manufacturer's Instructions: Instructions, stipulations, directions, and recommendations issued in printed form by the manufacturer of a product addressing handling, installation, erection, and application of the product; Manufacturers Instructions are not prepared especially for the Work.
- B. Shop Drawings: Drawings, diagrams, schedules, and other data specially prepared for the Work to illustrate some portion of the Work. Shop drawings include, but not necessarily be limited to:
 - 1. Custom-prepared data such as fabrication or erection/installation (working) drawings.
 - 2. Scheduled information, setting diagrams, actual shop work manufacturing instructions, custom templates, special wiring diagrams, coordination drawings, individual system or equipment inspection and test reports including performance curves and certifications, as applicable to the Work.
- C. Product Data: Illustrations, standard schedules, performance charts, brochures, diagrams and other information to illustrate materials or equipment for some portion of the Work.
 - 1. Product data as specified in individual Sections, and as applicable to the Work shall include, but not necessarily be limited to:
 - a. Standard prepared data for manufactured products (sometimes referred to as catalog data or "cuts").
 - b. Manufacturer's product specifications.
 - c. Installation instructions.
 - d. Availability of colors and patterns.
 - e. Manufacturer's printed statements of compliance and applicability.
 - f. Roughing-in diagrams and templates.
 - g. Product photographs.
 - h. Standard wiring diagrams.
 - i. Performance curves and operational-range diagrams.
 - j. Production or quality control inspection and test reports and certifications, and mill reports.
 - k. Operating and maintenance instructions and recommended spare parts listing and printed product warranties.
- D. Samples: Physical examples which illustrate materials, equipment, or workmanship and establish standards by which the Work will be judged. Samples specified in individual Sections, include, but are not necessarily limited to, physical examples of the work such as sections of manufactured or fabricated work, small cuts or containers of materials, complete units of repetitively-used products, color/texture/pattern swatches and range sets, specimens of coordination of visual effect, graphic symbols and units of work to be used by the Engineer or others for

independent inspection and testing, as applicable to the Work.

5.0 PROCEDURES

- A. The Contractor shall deliver submittals to the Construction Manager at the address provided to Contractor by the Construction Manager. The Contractor is required to allow adequate time in its project schedule for the preparation and review of the submittal to ensure that the submittal will serve its intended purpose. The Contractor is encouraged to mark the submittal “high”, “normal” or “low” priority to assist the reviewer in prioritizing the submittal reviews during periods of high volume of submissions.
- B. Transmittal Form - Unless otherwise specified, submittals regarding material and equipment shall be accompanied by a transmittal form. A separate transmittal form shall be used for each specific item, class of material, equipment, and items specified in separate, discrete sections, for which the submittal is required. Submittal documents common to more than one piece of equipment shall be identified with all the appropriate equipment numbers. Submittals for various items shall be made with a single form when the items taken together constitute a manufacturer's package or are so functionally related that expediency indicates checking or review of the group or package as a whole. The specification section and subsection or paragraph to which the submittal is related shall be indicated on the transmittal form.
- C. Assign each submittal a unique number. Clearly note the submittal numbers on the transmittal. Number each submittal with the identifying specification section, followed by a sequential number that represents the Contractor's assigned number of 01, 02, et cetera. Resubmittals shall be numbered by adding a dot (.) and 01, 02, 03, et cetera to the original submittal number, depending on the number of times the submittal has been resubmitted. For example: if Submittal 03300-01 requires a resubmittal, the first resubmittal will bear the designation “03300-01.01” and the second resubmittal will bear the designation “03300-01.02” and so on.
- D. Submit specified number of copies of submittal. Should the Contractor require more returned copies of any particular submittal, the Contractor shall furnish an equal greater number of copies to the Construction Manager than is specified.
- E. Provide or furnish products and execute the Work in accordance with accepted submittals, unless in conflict with Contract Documents.
- F. Deviations From The Contract – If the submittals show any deviations from the Contract requirements, the Contractor shall submit with the submittal submission a separate written description of such deviations and the reasons therefore. If the City accepts such deviation, the Owner shall issue an appropriate Contract Change Order, except that, if the deviation is minor, or does not involve a change in price or in time of performance, a Change Order need not be issued. If any deviations from the Contract requirements are not noted on the submittal, the review of the shop drawing shall not constitute acceptance of such deviations.

6.0 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

- A. Submit Shop Drawings, Product Data, Samples, and other pertinent information in sufficient detail to show compliance with specified requirements.
- B. Check, verify, and revise submittals as necessary to bring them into conformance with Contract Documents and actual field conditions.
 - 1. Determine and verify quantities, dimensions, specified design and performance criteria, materials, catalog numbers, and similar data.
 - 2. Coordinate submittal with other submittals and with the requirements of the Contract Documents.
- C. Field Verification: Prior to submitting shop drawings, Contractor shall have determined and verified all field measurements, elevations, potential conflicts, quantities and dimensions. This verification may require potholing.
- D. After completion of checking, verification, and revising; stamp, sign and date submittals indicating review and approval; and submit to Construction Manager.
 - 1. Stamp and signature indicates Contractor has satisfied shop drawing review responsibilities and constitutes Contractor's written approval of shop drawing.
 - 2. Shop drawings without Contractor's written approval will be returned for resubmission.
- E. Shop Drawings: Submit eight (8) copies. Three (3) will be returned with reviewer's comments and stamp.
- F. Product Data and Manufacturer's Instructions: Submit four (4) copies. Excise or cross out non-applicable information and clearly mark applicable information with citations to and terminology consistent with Contract Documents.
 - 1. One (1) copy will be returned with reviewer's comments and stamp.
- G. Samples: Submit two (2) samples labeled with reference to applicable Contract Documents. Label will be returned with reviewer's selection when appropriate, comments and stamp. Samples will not be returned unless return is requested in writing and additional sample is submitted.
- H. Special Samples: Submit one (1) sample labeled with reference to applicable Contract Documents. Sample and one (1) label will be returned for installation in the Work.

7.0 MANUFACTURER'S INSTRUCTIONS

- A. Submit manufacturer's instructions whenever made available by manufacturers and when installation, erection, or application in accordance with manufacturer's instructions is required by the Specifications. Submit manufacturer's instructions prior to installation, erection, or application of equipment and other project

components. Submit manufacturer's instructions in accordance with requirements for Product Data.

8.0 ENGINEER'S REVIEW

- A. The Engineer's review of submittals shall not release Contractor from Contractor's responsibility for performance of requirements of Contract Documents. Neither shall Engineer's review release Contractor from fulfilling purpose of installation nor from Contractor's liability to replace defective work. The Contractor shall not consider submittals as Contract Documents. The purpose of submittals is to demonstrate how Contractor intends to conform to the Contract Documents and design concepts. Engineer will be entitled to rely upon the accuracy or completeness of designs, calculations, or certifications made by licensed professionals accompanying a particular submittal whether or not a stamp or seal is required by Contract Documents or Laws and Regulations.
- B. The Engineer's review of shop drawings, samples, or test procedures will be only for conformance with design concepts and for compliance with information given in Contract Documents. The Engineer's review does not extend to:
 - 1) Accuracy of dimensions, quantities, or performance of equipment and systems designed by Contractor.
 - 2) Contractor's means, methods, techniques, sequences, or procedures except when specified, indicated on the Drawings, or required by Contract Documents.
 - 3) Safety precautions or programs related to safety which shall remain the sole responsibility of the Contractor.
- C. Except as may be provided in subsequent specifications; a submittal will be returned within ten (10) working days. When a submittal cannot be returned within that period, Construction Manager will, within a reasonable time after receipt of the submittal, give notice of the date by which that submittal will be returned. The returned submittal shall indicate on the following actions:
 - 1) If the review indicates that the material, equipment or work method complies with the project manual, submittal copies will be marked "NO EXCEPTIONS TAKEN." In this event, the Contractor may begin to implement the work method or incorporate the material or equipment covered by the submittal.
 - 2) If the review indicates limited corrections are required, copies will be marked "MAKE CORRECTIONS NOTED." The Contractor may begin implementing the work method or incorporating the material and equipment covered by the submittal in accordance with the noted corrections. Where submittal information will be incorporated in O&M data, a corrected copy shall be provided.
 - 3) If the review reveals that the submittal is insufficient or contains incorrect data, copies will be marked "AMEND AND RESUBMIT." Except at its own risk, the Contractor shall not undertake work covered by this submittal until it has been revised, resubmitted and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED."

- 4) If the review indicates that the material, equipment, or work method does not comply with the project manual, copies of the submittal will be marked "REJECTED - SEE REMARKS." Submittals with deviations that have not been identified clearly may be rejected. Except at its own risk, the Contractor shall not undertake the work covered by such submittals until a new submittal is made and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED."
- 5) If the submittal information does not require a review by the Engineer, copies of the submittal will be marked "Review not Required" and will be returned without review.

9.0 REVIEW COSTS

- A. The City's cost for review of submittals for the same proposed materials, equipment or work shall be apportioned as follows:
 - 1) The cost of review of the initial submittal and the first revised submittal will be borne by the City.
 - 2) The cost to review all additional revised submittals after the first revised submittal will be charged to the Contractor. The cost of review shall include, without limitation, administrative, design and engineering activities directly related to review of submittals.
 - 3) If a submittal is approved and the Contractor elects to submit an alternate item for review for the same application, the Contractor shall be responsible for the review costs for the alternate submittal. The cost of review shall include, without limitation, administrative, design and engineering activities directly related to review of submittals.

10.0 SUBMITTALS FOR INFORMATION OR RECORD ONLY

- A. Where specified, the Contractor shall furnish five (5) copies of informational submittals to the Construction Manager. Incomplete or inadequate product data, test/inspection reports will be returned to the Contractor for re-submittal. The Contractor is to pay for all mill and factory tests that are required in the Contract Documents. No copies of informational submittals will be returned unless they are found to be incomplete or inadequate.

11.0 SUBSTITUTES OR "OR EQUAL" ITEMS AND PRODUCT OPTIONS

- A. Whenever materials or equipment are specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the naming of the item is intended to establish the type, function, and quality required. Unless the name designated a "sole source" and/or is followed by words indicating that no substitution is permitted, materials, or equipment of other Suppliers may be accepted by Engineer if sufficient information is submitted by Contractor to allow Engineer to determine that the material or equipment proposed

is equivalent or equal to that named.

- B. The procedure for review by Engineer will include the following as may also be supplemented in the Contract Documents. Requirements for review of substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor. If Contractor wishes to furnish or use a substitute item of material or equipment, Contractor shall make written application to the Construction Manager for acceptance thereof, certifying that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar and of equal substance to that specified and be suited to the same use as that specified. The application will state that the evaluation and acceptance of the proposed substitute will not prejudice Contractor's achievement of Substantial Completion on time, whether or not acceptance of the substitute for use in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with City for Work on the Project) to adapt the design to the proposed substitute and whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty. All variations of the proposed substitute from that specified will be identified in the application and available maintenance, repair, and replacement service will be indicated. The application will also contain an itemized estimate of all costs that will result directly or indirectly from acceptance of such substitute, including costs of redesign and claims of other contractors affected by the resulting change, all of which shall be considered by Engineer in evaluating the proposed substitute. The City may require Contractor to furnish at Contractor's expense additional data about the proposed substitute.
- C. If a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, sequence, technique or procedure of construction acceptable to Engineer, if Contractor submits sufficient information to allow Engineer to determine that the substitute proposed is equivalent to that indicated or required by the Contract Documents. The procedure for review by Engineer will be similar to that provided in Section 01330 – Submittals.
- D. All requests for substitution shall be submitted within thirty-five (35) calendar days after award of the contract. The Engineer will be allowed a reasonable time within which to evaluate each proposed substitute. The Engineer and City will be the sole judge of acceptability, and no substitute will be ordered, installed or utilized without Engineer's prior written acceptance that will be evidenced by either a Change Order or an accepted Shop Drawing. City may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute. Contractor shall pay all costs for redesign required by the implementation of the proposed substitute.
- E. If a discrepancy is found or confusion arises in the contract documents or direction from either the City or Construction Manager, submit an RFI. Attention is directed to Section 5-1.40 Requests for Information in the State Standard Specifications.

*****END OF SECTION*****

SECTION 01400
QUALITY CONTROL AND INSPECTION

1.0 CONTRACTOR'S QUALITY CONTROL

1.1 General

The Contractor is to ensure that products, services, workmanship and Site conditions comply with the requirements of the Contract Documents by coordinating, supervising, testing and inspecting its Work. The Contractor shall utilize only suitably qualified, skilled and trained personnel experienced in the tasks required to complete the Work in accordance with the quality requirements of the Contract Documents. Should there be no quality basis specifically prescribed for any portion of the Work, the quality and testing procedures shall be in accordance with the best-accepted practices of the construction industry for the locale of the Project, for projects of this type, or standards set by engineering or technical societies (e.g. ASTM or ASHRAE), whichever is more stringent.

1.2 Quality of Work

The Contractor's quality of Work shall include, but not be limited to, the following requirements:

- A. Quality of Products: Unless otherwise indicated or specified, all products shall be new, free of defects, and fit for the intended use.
- B. Quality of installation: All Work shall be produced plumb, level, square and true, or true to indicated angle, and with proper alignment and relationship between the various elements, as shown on or required by Contract Documents.
- C. Protection of Completed Work: Take all measures necessary to preserve completed Work free from damage, deterioration, soiling, and staining, until acceptance by City.
- D. Standards and Code Compliance and Manufacturer's Instructions and Recommendations: Unless more stringent requirements are indicated or specified, comply with manufacturer's instructions and recommendations, reference standards and building code research report requirements in preparing, fabricating, erecting, installing, applying, connecting, and finishing Work.
- E. Deviations from Standards and Code Compliance and Manufacturer's instructions and Recommendations: Secure Owner's advanced written consent. Document and explain all deviations from reference standards and building code research report requirements and manufacturer's product installation instructions and recommendations, including acknowledgement by the manufacturer that such deviations are acceptable and appropriate for the Project.
- F. Verification of Quality: Work shall be subject to verification of quality by City in accordance with provisions of the Contract Documents.

1.3 Defective Work

Defective Work shall be modified, replaced, repaired or redone by the Contractor at no change in Contract Sum or Contract Time. Acceptance of Defective Work, without specific written acknowledgement and approval of City, shall not relieve the Contractor of the obligation to correct such Work. Should City determine that it is not feasible or in City's interest to require Defective Work to be repaired or replaced, an equitable reduction in Contract Sum shall be made by agreement between City and Contractor. If equitable amount cannot be agreed upon, a Construction Change Directive will be issued and the amount in dispute resolved in accordance with the Contract Documents. City and City's consultants disclaim any and all responsibility for Work produced not in conformance with the Drawings and Specifications. Contractor shall have full responsibility for all consequences resulting from Defective Work, including without limitation all delays, disruptions, extra inspection and correction costs by Contractor and City and re-Work, and extra time and costs of all types. Contractor waives excuses for defective work relating to City's prior review of Submittals and/or prior failure to notice Defective Work in place on inspection.

2.0 INSPECTION AND TESTING

Additional requirements for tests are described in these Contract Documents.

2.1 General

Where the Contract Documents require work to be field tested or approved, it shall be tested in the presence of the Construction Manager or its authorized representative. The Construction Manager shall have the right to witness all on-site tests performed by the Contractor and any shop tests. The results of any tests performed by the Contractor shall be made available for the information of the Construction Manager. Inspections, tests or favorable reviews by the Construction Manager or others shall not relieve the Contractor from its obligation to perform the work in accordance with the requirements of the Contract Documents or for its sole responsibility for the quality of workmanship and materials.

Except as specifically required under the technical specifications for testing and inspection, all tests for materials furnished by the Contractor will be done in accordance with commonly recognized standards of national organizations. Where tests are to be performed by the Construction Manager or by an independent laboratory or agency, the Contractor shall furnish such samples of all materials as required by the Construction Manager without charge. The sample or samples of materials to be tested shall be selected by such laboratory or agency, or the Construction Manager, and not by the Contractor. No material for which the Contract Documents require the submittal and approval of tests, certificates of compliance or other documentation shall be incorporated in the Work until such submittal has been made and approved. The Contractor shall provide safe access, including plants where materials or equipment are manufactured or fabricated, for the Construction Manager and inspectors to adequately inspect the quality of work and the conformance with the Contract Documents. The Contractor shall furnish the Construction Manager the necessary labor and facilities for such things as excavation in the compacted fill to the depths required to take samples. The Contractor shall provide adequate lighting, ventilation, ladders and other protective facilities as may be necessary for the safe performance of inspections.

Upon completion of the Work the Construction Manager will conduct a final inspection as provided for in Section 00700. Records shall be available at all reasonable hours for

inspection by other local or State agencies to ascertain compliance with laws and regulations.

Neither the employment of independent testing and inspection agency nor observations or tests by City and City's consultants shall in any manner relieve the Contractor of obligation to perform Work in full conformance to all requirements of the Contract Documents. The City reserves the right to reject all Work not in conformance to the requirements of the Contract Documents, or otherwise Defective.

2.2 Notice

The Contractor shall notify the Construction Manager in writing at least twenty-four (24) hours before any field testing or special inspections are required to be performed by the Construction Manager or independent laboratory furnished by the City. The Contractor shall notify the Construction Manager at least two hours before any inspection is required to be performed or to witness the Contractor's on-site field testing.

Whenever the Contractor varies the period during which work is carried on each day, the Contractor shall give due notice to the Construction Manager so that proper inspection may be provided. Any work done in the absence of the Construction Manager shall be considered to be rejected. It will be the responsibility of the Contractor to demonstrate to the satisfaction the Construction Manager that the work meets all conditions of the specification and if such conditions are not met to remove the work.

The Contractor shall give the Construction Manager written notification at least thirty (30) days prior to the shipment of materials and equipment to be tested and/or inspected at the point of origin. Satisfactory tests and inspections at the point of origin shall not be construed as a final acceptance of the materials and equipment nor shall such tests and inspections preclude retesting or reinspection at the site of the Work.

2.3 Costs of Testing

The Contractor shall be responsible for, and shall pay for, all quality control and off-site tests of materials required including all source and mix design tests for the approval of soil and concrete materials. The City will perform the soils and concrete confirmation tests detailed in the Technical Specifications during the performance of the Work. City will retain and pay a qualified testing agency to perform soil compaction testing and work identified as requiring special inspections and testing as defined by UBC section 1701. All other testing required by the technical specifications shall be the responsibility of the Contractor.

The Contractor shall be responsible for, and shall pay for, all source quality control and all on-site tests of materials required, except those tests specifically noted to be performed and paid for by the City.

The Construction Manager shall have the authority to require additional tests or inspections due to the manner in which the Contractor executes its work. Examples of such additional tests and inspections include; tests of materials substituted for previously accepted materials, or substituted for specified materials, or retests made necessary by failure of material to comply with the requirements of the Specifications. Where such tests and inspections are required by Contract to be performed by the City, the City will pay for the

additional tests and inspections but will issue an unilateral Change Order to deduct these costs from the Contract price.

2.4 Work Covered Prior to Inspection and/or Testing

Work requiring inspection and/or testing shall not be concealed or buried prior to the acceptance of such inspection or testing. Work covered without the favorable review or consent of the Construction Manager shall, if required by the Construction Manager, be uncovered for inspection and/or testing at the Contractor's expense.

2.5 Work Covered With Prior Inspection and/or Testing

If the Construction Manager considers it necessary or advisable that covered work which was favorably inspected and tested be uncovered for reinspection and/or retesting, the Contractor, at the Construction Manager's request, will uncover, expose or otherwise make available for observation, inspection or testing as the Construction Manager may require, that portion of the work in question, furnishing all necessary labor, materials, tools, and equipment. If it is found that such work is defective, the Contractor will bear all expenses of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction. If, however, such work is not found to be defective 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, testing and reconstruction, and a Change Order shall be issued for such additional work.

2.6 Special Tests and Inspections

As provided for in the Contract Documents, laws and regulations, specialized tests and inspections shall be performed by special inspectors certified by the International Conference of Building Officials (ICBO). Unless otherwise stated in the Contract Documents, each of these tests will be performed and paid for by the City.

2.7 Inspections and Tests by Serving Utilities

Unless otherwise indicated in the Contract Documents, the Contractor shall cause, schedule and conduct inspections and tests by serving Utilities required for the Work under this Contract.

2.8 Inspections and Tests by Serving Manufacturers

Unless otherwise indicated in the Contract Documents, the Contractor shall cause all required tests and inspections to be conducted by materials, equipment or systems manufacturers. Additionally, all tests and inspections required by materials, equipment or systems manufacturers as conditions of warranty or certification of Work shall be made, the cost of which shall be included in the Contractor's bid.

*****END OF SECTION*****



CITY OF PLACERVILLE, CALIFORNIA\
DEVELOPMENT SERVICES DEPARTMENT
ENGINEERING DIVISION

Madrone and Giovanni Sewer Lift Stations Rehabilitation Project

Project No. 40330

TECHNICAL SPECIFICATIONS

August 25, 2017

TECHNICAL SPECIFICATIONS

CITY OF PLACERVILLE LIFT STATION UPGRADES

City of Placerville
3101 Center Street
Placerville, CA 95667



August 25, 2017

Domenichelli & Associates, Inc.
1101 Investment Blvd.
El Dorado Hills, CA 95762

D&A Project No. PLA-04

SECTION 02000
ENVIRONMENTAL CONDITIONS

PART 1 – GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Seismic Conditions
 - 2. Weather Conditions
 - 3. Elevation

1.02 SEISMIC CONDITIONS

- A. Approximate Coordinates:
 - 1. Giovanni LS: N 38.747° W 120.794
 - 2. Madrone LS: N 38.746° W 120.792°
- B. I = 1.5
- C. Assume Site Class C

1.03 WEATHER CONDITIONS

- A. Freezing conditions exist during the winter months.
- B. 100 degrees plus temperatures may exist during the summer months.
- C. Ground Snow Load: 32 psf

1.04 ELEVATION

- A. Elevations at the sites are approximately
 - 1. Giovanni LS: 2,170 feet
 - 2. Madrone LS: 2,060 feet.

1.05 LIFT STATION ADDRESSES

- A. Giovanni LS: 2462 Giovanni Dr., Placerville, CA 95667
- B. Madrone LS: 1080 Madrone Lane, Placerville, CA 95667

END OF SECTION

SECTION 02200
EARTHWORK

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Clearing, grubbing, and site preparation.
2. Removal and disposal of debris.
3. Handling, storage, transportation and disposal of excavated material.
4. Sheeting, shoring, bracing and protection work.
5. Pumping and dewatering as required for all construction.
6. Excavation and trenching.
7. Backfilling.
8. Pipe embedment.
9. Construction of fills and embankments.
10. Surfacing and grading.

B. Related sections:

1. Related Work specified elsewhere:
 - a. Demolition: Section 02050
 - b. Paving and Surfacing: Section 02500
 - c. Cast-in-Place Concrete: Section 03001
 - d. Pipe and Pipe Fittings: Section 15060
 - e. Steel Pipe: Section 15061
 - f. Ductile Iron Piping: Section 15062

C. No Geotechnical Engineering Study was prepared for this project.

1.02 SUBMITTALS

A. Material samples:

1. Coarse base rock.
2. Drain gravel.
3. Road base.
4. Pipe embedment.
5. Engineered fill.
6. General backfill.

B. Gradation curves:

1. Coarse base rock.
2. Drain gravel.
3. Road base.

- 4. Pipe embedment.
- C. Dewatering:
 - 1. Proposed equipment.
 - 2. Well or sump location, size, and details of construction.
 - 3. Size and layout of discharge headers.
 - 4. Copy of the approved discharge permit.
- D. Blasting plan:
 - 1. Blasting not allowed

1.03 PROJECT/SITE CONDITIONS

- A. Environmental requirements: See Specification Section 02000
- B. Protection:
 - 1. Protect adjacent structures and surrounding areas from damage during excavation, filling, backfilling, and blasting.
 - 2. Do not remove trees from outside excavation or fill areas; protect from permanent damage by construction activities.
 - 3. Protect work from erosion or other similar types of damage until the project or segment of project has been completed.
 - 4. Provide temporary bridges for roadways, walkways, driveways, etc.
- C. Weather:
 - 1. Do not backfill or construct fills or embankments during freezing weather
 - 2. Do not use frozen materials, snow, or ice in any backfill, fill area or embankment.
 - 3. Do not backfill or construct fill or embankments on frozen surfaces.
 - 4. Protect all excavations from entry of surface runoff.
- D. Naturally Occurring Asbestos (NOA)
 - 1. The project site is mapped by the California Geological Survey in Special Report 190 as an area "Least Likely to Contain NOA".
 - 2. If the contractor finds evidence of NOA presence, notify the Owner's Representative immediately.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Classification of excavated materials:
 - 1. None.
 - 2. Remove and handle excavated materials regardless of its type, character, composition, condition, or depth.

B. Coarse base rock:

1. Granular material, maximum size 3 inches.
2. Less than 10 percent passing 1-inch sieve.
3. Free of dust, clay, or trash.
4. Compact with vibratory plate compactor under the direction of the Owner's Representative.

C. Drain gravel:

1. Crushed rock.
2. Granular material, maximum size 1-1/2 inches.
3. At least 95 percent retained on the No. 4 sieve.
4. Less than 5 percent passing the No. 200 sieve.
5. Compact with vibratory plate compactor under the direction of the Owner's Representative.

D. Road base:

1. Caltrans specification for Class II aggregate base.
2.

<u>Sieve Size</u>	<u>% Passing Sieve</u>
1"	100
3/4"	90-100
#4	35-55
#30	10-30
#200	2-9
3. Serpentine rock aggregate base will not be allowed.
4. Compact to at least 95 percent of the relative compaction based on the ASTM D1557 test method.
5. The sand equivalent shall not be less than 30.
6. The durability index shall not be less than 35.

E. Pipe embedment:

1. CalTrans 3/4" Aggregate Base

F. Engineered fill:

1. For all pipe backfill, exclusive of pipe embedment.
2. For all backfill around all structures.
3. Provide all on site or off site borrow materials as necessary to complete the project.
4. Granular material, maximum size 3 inches for trench backfill, well graded, sand and gravel mix with a maximum of 25 percent passing the No. 200 sieve. Process as necessary to meet gradation requirements.
5. Free from brush, stumps, logs, roots, debris, and other deleterious material.
6. Compact to at least 95 percent of the relative compaction based on the ASTM D1557 test method.
7. Compact to at least 98 percent of the relative compaction based on the ASTM D1557 test method in select areas specifically noted on plans.

G. General backfill:

1. Only for areas specifically labeled general backfill.
2. Native material.
3. Free from brush, stumps, logs, roots, debris, and other deleterious material.
4. Well graded, maximum rock 6-inch. Process as necessary to meet gradation requirements.
5. Compact to at least 90 percent of the relative compaction based on the ASTM D1557 test method.

H. Topsoil:

1. Native material removed and stockpiled before excavation.
2. Free from trash and debris.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Field verify the location of all underground utilities, pipelines, and structures.
1. Clear sites to be occupied by permanent construction of logs, trees, roots, brush, tree trimmings, and other objectionable material and debris.
 2. Grub stumps.
 3. Clean and strip subgrade for fills and embankments of surface vegetation, sod, and organic topsoil.
 4. Remove waste materials from site and dispose daily.
 5. Burning on site is not allowed.
 6. Verify ground water levels and risk conditions in the Geotechnical Report.

3.02 INSTALLATION

A. General:

1. Perform work in a safe and proper manner with appropriate precautions against hazard.
2. Provide adequate working space and clearances for work performed within excavations and for installation and removal of concrete forms.
3. Do not undercut excavation faces for extended footings.
4. Remove soft soil materials, loose materials, wood, debris and deleterious substances encountered within excavated areas.
5. Clean subgrades of loose material before concrete is placed thereon.
6. Preservation of trees.
 - a. Do not remove trees outside fill or excavated areas, except as authorized by Owner's Representative.

- b. Protect trees to remain from permanent damage by construction operation.
7. Except as otherwise authorized, indicated, or specified, replace all material excavated below the bottom of existing concrete walls, footings, slabs on grade and foundations with concrete placed at the same time and monolithic with concrete above.

B. Topsoil:

1. Remove and stockpile sufficient quantity of topsoil to surface to a minimum depth of 4 inches fill, embankment and other areas where the original topsoil will be removed or damaged. At the completion of other work in each area, place and grade topsoil.

C. Dewatering:

1. Provide and maintain adequate dewatering equipment to remove and dispose of surface and groundwater entering excavations, trenches, existing sump pit, and other parts of the work. Existing pipe and bedding will act as a conduit into excavations. Contractor shall be responsible to control and dewater all water in excavations.
2. Keep each excavation dry during subgrade preparation and continually thereafter until the structure to be built or the pipe to be installed is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result.
3. Dewater excavations which extend to or below groundwater by lowering and keeping the groundwater level beneath such excavation at least 24 inches below the bottom of the excavation.
4. Divert surface water or otherwise prevent it from entering excavated areas or trenches to the extent practical without damaging adjacent property.
5. Contractor is responsible for the condition of any pipe or conduit he uses for drainage. All drainage pipes shall be left clean and free of sediment.
6. Provide and pay for all power, services, manpower, etc., to maintain a completely dry construction site.
7. Obtain all required local, State and Federal permits required to discharge water pumped from the excavations.

D. Sheet piling, shoring, and bracing:

1. Provide proper and substantial sheet piling, shoring and bracing as required to prevent caving or sliding, to protect workmen, and the Work and to protect existing structures and facilities.
2. Design and build sheet piling, shoring and bracing to withstand all loads that might be caused by earth movement or pressure and to be rigid, maintaining shape and position under all circumstances.
3. Do not pull trench sheet piling before backfilling.

E. Stabilization:

1. Thoroughly compact and consolidate subgrades for roadways, all concrete structures and trench bottoms so they remain firm, dense, and intact during required construction activities.
2. Scarify subgrade to a depth of 6 to 8 inches and prior to subgrade compaction.

3. Remove all mud and muck during excavation.
4. Reinforce subgrades with crushed rock or gravel if they become mucky during construction activities.
5. Finished elevation of stabilized subgrades is to be at or below subgrade elevations indicated on Drawings.
6. Allow no more than 1/2-inch depth of mud or muck to remain on trench bottoms when pipe bedding material is placed thereon.

F. General fill requirements:

1. Maximum loose lift in all fill areas: 8 inches.
2. Compact with mechanical tampers approved by the Owner's Representative
3. Compaction by ponding or jetting is not permitted.
4. Backfill both sides of foundation walls at the same time. Maximum difference in fill elevation: 1 foot 0 inches.
5. Backfill retaining wall structures only after all walls and support slabs are complete and the concrete has reached its 28-day strength.
6. Use small hand operated compactor within 3 feet of walls.
7. Do not backfill until leak test on water containing structures is complete and accepted by the Owner's Representative.
8. Use of Controlled Density Fill per Section 03001 shall be allowed only where shown on the Drawings. Contractor may use Controlled Density Fill in other locations as approved by the Owner's Representative.

G. Coarse base rock: Provide as shown on Drawings.

H. Drain gravel:

1. Provide as shown on Drawings under all structures.
2. Provide drain gravel on embankment under riprap.

I. Road base:

1. Minimum 6 inches thick and thicker where specifically shown on Drawings.
2. Alternate to use as pipe embedment.
3. Under road construction.
4. Under slabs on grade.

J. Pipe embedment:

1. Under all pipes.
2. Backfill both sides of pipe installation simultaneously.

K. Engineered fill:

1. Backfill against all walls.
2. Under all structures.
3. Under all road construction and slopes.

L. General backfill: All other areas where fill is required to obtain the grades shown on the Drawings.

M. Roadway excavation:

1. Excavate unsuitable material from subgrade.
2. After shaping, roll subgrade compacted to 95 percent of relative compaction based on the ASTM D1557 test method, to a minimum of 6 inches below subgrade.

N. Disposal of excess excavated materials:

1. Use excess excavated suitable materials in fills and embankments as indicated on the Drawings to the extent needed.
2. Remove unused material from the site and dispose of it.
3. Remove debris, junk, stones, stumps, logs, roots, and other unsuitable material from the site.
4. Contractor is responsible for all excavated material, disposal at their expense.

O. Final grading:

1. After completion of all other outside work and after backfilling and embankments are completed and settled, bring to grade at the indicated elevations, slopes, and contours all areas of the site to be graded.
2. Graders and other power equipment may be used for final grading and slope dressing if the result is uniform and equivalent to hand work.
3. Grade all surfaces for effective drainage.
4. Provide a 2 percent minimum slope except as otherwise required.
5. Grade and surface to Owner's Representative's satisfaction.

P. Settlement:

1. Guarantee against settlement for all fills, embankments, and backfills is one (1) year from final completion of Contract.
2. Repair or replace within 30 days after notice by Owner's Representative.

3.03 FIELD QUALITY CONTROL

A. Owner's Representative will arrange and pay for all in-place tests to determine compliance of in-place and backfill materials and compaction with the specifications.

B. Contractor must notify Owner's Representative at least 24 hours in advance of backfill compaction activities.

C. Fills and embankment:

1. Owner's Representative will arrange and pay for relative compaction test based on the ASTM D1557 test method, on each type of fill material.
2. Minimum testing of in-place compaction test for each lift of material placed.

D. Pipe embedment and backfill:

1. Contractor shall provide initial gradation tests for each type of imported material.

2. Owner's Representative shall provide relative compaction tests, (ASTM D1557), for each type of embedment or backfill material proposed. Contractor shall provide sufficient size sample for testing.
 3. One (1) in-place density test for each 100 feet of trench, per lift.
 4. Other in-place density test selected at random.
- E. Retests of failed compaction shall be performed by the Owner's Representative, but shall be paid for by the Contractor.

END OF SECTION

SECTION 02500
PAVING AND SURFACING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Aggregate base and asphaltic concrete paving for access roads, walkways and parking areas.
2. Repair pavement removed or damaged during construction to its original or better condition.

B. Related sections:

1. Related Work specified elsewhere:
 - a. Earthwork: Section 02200
 - b. Cast-in-Place Concrete: Section 03001

1.02 REFERENCES

A. Reference standards:

1. ASTM C29: Unit Weight and Voids in Aggregate.
2. ASTM C88: Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
3. ASTM C117: Materials Finer than No. 200 Sieve in Mineral Aggregates by Washing.
4. ASTM C126: Sieve or Screen Analysis of Fine and Coarse Aggregates.
5. ASTM C128: Specific Gravity Test and Absorption of Fine Aggregate.
6. ASTM D4: Bitumen Content.
7. ASTM D5: Penetration of Bituminous Material.
8. ASTM D70: Specific Gravity of Semi-Solid Bituminous Materials.
9. ASTM D93: Flash Point by Density-Martens Closed Tester.
10. ASTM D113: Ductility of Bituminous Materials.
11. ASTM D1188: Bulk Specific Gravity of Compacted Bituminous Mixtures Using Paraffin Coated Specimens.
12. ASTM D2041: Theoretical Maximum Specific Gravity of Bituminous Paving Mixtures.
13. ASTM D2172: Quantities Extraction of Bitumen from Bituminous Paving Mixtures.
14. ASTM D2419: Sand Equivalent Value of Soils and Fine Aggregate.
15. ASTM D290: Bituminous Mixing Plant Inspection.
16. ASTM D946: Asphalt Cement for Use in Pavement Construction.
17. ASTM D692: Coarse Aggregate for Bituminous Paving.
18. ASTM D1073: Fine Aggregate for Bituminous Paving Mixtures.
19. ASTM D1016: Cutback Asphalt (Slow Curing Type).
20. ASTM D2027: Cutback Asphalt (Medium Curing Type).
21. ASTM D2028: Cutback Asphalt (Rapid Curing Type).

- 22. A.I. MS-2: Mix Design Method for Asphalt Concrete.
- 23. CALTRANS: 2015, Section 39

1.03 SYSTEM DESCRIPTION

- A. Design requirements:
 - 1. Density:
 - a. Minimum acceptable density of in-place course materials is 97 percent of the recorded laboratory specimen density.
 - 2. Design mix:
 - a. Determine design mix based upon aggregates furnished:
 - 1) By independent testing laboratory at Contractor's expense.
 - 2) Grade dependent upon temperature.
 - 3) Acceptable to Owner's Representative.
 - 3. Allowable loading:
 - a. Based on AASHTO standards and H-20 loading.
- B. Performance requirements:
 - 1. Paving shall meet California (CALTRANS HMA [Hot Mix Asphalt]) and local requirements for texture, density, and surface smoothness.

1.04 SUBMITTALS

- A. Product data:
 - 1. Samples: Provide samples of materials for laboratory testing and job-mix design (Contractor to provide).
- B. Test reports: Submit laboratory reports for following material tests:
 - 1. Coarse and fine aggregate from each material source and each required grading.
 - a. Sieve analysis: ASTM C136 (AASHTO T19).
 - b. Unit weight of slag: ASTM C29 (AASHTO T19).
 - c. Soundness: ASTM C89 (AASHTO T104).
 - d. Sand equivalent: ASTM D2419 (AASHTO T176).
 - e. Abrasion of coarse aggregate: ASTM 131 (AASHTO T96), for surface coarse aggregates only.
 - 2. Asphalt cement for each penetration grade.
 - a. Penetration: ASTM D5 (AASHTO T49).
 - b. Viscosity (Kinematic): ASTM D2170 (AASHTO T201).
 - c. Flash point: ASTM D92 (AASHTO T48).
 - d. Ductility: ASTM D113 (AASHTO T51).
 - e. Solubility: ASTM D4 (AASHTO T44).
 - f. Specific gravity: ASTM D70 (AASHTO T43).
 - 3. Job-mix design mixtures for each material or grade.
 - a. Bulk specific gravity for fine aggregate: ASTM C128 (AASHTO T84).
 - 4. Uncompacted asphalt concrete mix: maximum specific gravity ASTM D2041 (AASHTO T209).
 - 5. Compacted asphalt concrete mix.

- a. Bulk density: ASTM D1188 (AASHTO T166).
 - b. Marshall stability and flow: ASTM D1559.
- 6. Density and voids analysis.
 - a. Provide each series of asphalt concrete mixture test specimens in accordance with A.I. MS-2 "Mix Design Methods for Asphalt Concrete."
 - b. Use Marshall method of mix design unless otherwise directed or acceptable to Owner's Representative.
- 7. Sampling and testing of asphalt concrete mixtures for quality control during paving operations (provided by the Owner).
 - a. Uncompacted asphalt concrete mix.
 - 1) Asphalt cement content: ASTM D2172 (AASHTO T164).
 - 2) Penetration of recovered asphalt cement: ASTM D5 (AASHTO T49).
 - 3) Ductility of recovered asphalt cement: ASTM D113 (AASHTO T51).
 - b. Compacted asphalt concrete mix.
 - 1) Bulk density: ASTM D1188 (AASHTO T166).
 - 2) Marshall stability and flow: ASTM D1559.
 - c. Perform at least one test for each day's paving.
- 8. Asphalt plant inspection: ASTM D290.

1.05 QUALITY ASSURANCE

A. Qualifications:

- 1. The Contractor shall be regularly engaged in the construction of aggregate base and asphalt concrete pavement for a period of not less than five (5) years.

1.06 PROJECT/SITE CONDITIONS

A. Environmental requirements: See Specification Section 02000

- 1. Do not place asphaltic concrete when underlying surface is muddy, frozen or wet.
- 2. Do not place asphaltic concrete when air temperature is 50 degrees F or below.
- 3. Do not place asphaltic concrete when subgrade temperature is projected to be 40 degrees F or below in the following 24 hours.

B. Traffic control:

- 1. Maintain vehicular and pedestrian traffic during paving operations per CalTrans Manual of Traffic Control.
- 2. Provide barricades, warning signs, and warning lights for movement of traffic and safety and to cause the least interruption of work.

C. Existing condition:

- 1. The Contractor is to visit the site prior to bidding and familiarize himself with the existing site conditions.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Aggregate base: Per Section 02200
- B. Tack coat: Emulsified asphalt: SS-1 or SS-1h.
- C. Asphalt cement: CalTrans Section 39, grade determined by design mix.
- D. Aggregate for asphalt concrete, general:
 - 1. Sound, angular, crushed stone, crushed gravel, or crushed slag: ASTM D692.
 - 2. Sand, stone or slag screening: ASTM D1073.
 - 3. Provide aggregate in gradations for various courses to comply with local highway standards, CTSS 39.202 - Class A/B/C.
- E. Base course aggregates:
 - 1. Uncrushed gravel may be used in mixture if it meets design criteria specified.
 - 2. Provide uniform quality combined aggregates with a minimum sand equivalent value: 40 for heavy traffic areas.
- F. Surface course aggregates:
 - 1. Provide natural sand, unless sand prepared from stone, slag, or gravel or combinations are required to suit local conditions.
 - 2. Provide uniform quality combined aggregates with a minimum sand equivalent value: 50 for heavy traffic areas.
- G. Prime coat:
 - 1. Cut-back liquid asphalt.
 - 2. Slow-curing type: ASTM D2026, Grade or
 - 3. Medium-curing type: ASTM D2027, Grade or
 - 4. Rapid-curing type: ASTM D2028, Grade.
- H. Asphalt concrete per Caltrans specifications.

2.02 EQUIPMENT

- A. Bituminous pavers: Self-propelled, spreads without tearing surfaces, and controls pavement edges to true lines without use of stationary forms.
- B. Rolling equipment:
 - 1. Pneumatic tired roller.
 - 2. Two (2) or three (3) wheeled steel roller.
- C. Hand tools: Provide rakes, lutes, shovels, tampers, smoothing irons, pavement cutters, portable heaters, and other miscellaneous small tools as require to complete the work.

2.03 ACCESSORIES

- A. Line paint: CalTrans Standard Specification Section 84. Colors as selected by Owner's Representative.

2.04 MIXES

- A. Comply with CalTrans Section 39 HMA, for material storage, control and mixing, and for plant equipment and operation.
- B. Stockpiles:
 - 1. Keep each component of the various-sized combined aggregates in separate stockpiles.
 - 2. Maintain stockpiles so that separate aggregate sizes will not be intermixed and to prevent segregation.
- C. Heating:
 - 1. Heat the asphalt cement at the mixing plant to viscosity at which it can be uniformly distributed throughout mixture.
 - 2. Use lowest possible temperature to suit temperature-viscosity characteristics of asphalt.
 - 3. Do not exceed 350 degrees F (177C).
- D. Aggregate:
 - 1. Heat-dry aggregates to moisture content of not more than 5 percent.
 - 2. Deliver to mixer at recommended temperature to suit penetration grade and viscosity characteristics of asphalt cement, ambient temperature, and workability of mixture.
 - 3. Accurately weigh or measure dry aggregates and weigh or meter asphalt cement to comply with job-mix formula requirements.
- E. Mix aggregate and asphalt cement to achieve 90 to 95 percent coated particles for base mixtures and 85 to 90 percent coated particles for surface mixture, per ASTM D2489.
- F. Transporting:
 - 1. From mixing site in trucks having tight, clean compartments.
 - 2. Coat hauling compartments with lime-water mixture to prevent sticking.
 - 3. Elevate and drain compartment of excess solution before loading mix.
 - 4. Provide covers over asphalt concrete mixture to protect from weather and to prevent loss of heat.
 - 5. During periods of cold weather or for long distance deliveries, provide insulation around entire truck bed surfaces.

2.05 SOURCE QUALITY CONTROL

- A. Provide State of California weigh tickets on all asphalt emulsion used on the project.

- B. Provide certificate of compliance for hot mix asphalt including components, temperature, weights (gross and tare) and time of departure from plant.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of conditions:
 - 1. Record existing elevations in areas where asphalt paving exists.
 - 2. Check subgrade to verify compaction meets requirements.
 - 3. Check subgrade for conformity with elevations and sections immediately before placing aggregate base material.

3.02 PREPARATION

- A. Adjacent structures:
 - 1. The edges of contact surfaces such as curbs, manholes, sidewalks and walls to be painted with tack coat to provide bonded watertight joints.
 - 2. Protect structures to prevent staining on surfaces.
- B. Surface preparation:
 - 1. Place road base material in compacted layers not more than eight (8) inches thick.
 - 2. Spread, shape, and compact all aggregate base material deposited on the subgrade during the same day.
 - 3. Remove loose and foreign material from compacted road base surface immediately before application of paving.
- C. Prime coat:
 - 1. Uniformly apply at rate of 0.20 to 0.50 gal/sq yd. over compacted and cleaned road base surface.
 - 2. Apply enough material to penetrate and seal, but not flood the surface.
 - 3. Allow to cure and dry as long as required to attain penetration and evaporation of volatiles, and in no case less than 24 hours unless otherwise acceptable to the Owner's Representative.
 - 4. Blot excess prime coat with just enough sand to prevent pick-up under traffic.
 - 5. Remove loose sand before paving.
- D. Tack coat:
 - 1. Dilute material with equal parts of water and apply to contact surfaces of previously constructed asphalt concrete or Portland cement concrete and surfaces.
 - 2. Apply at rate of 0.05 to 0.15 gal/sq yd. of surface.
 - 3. Apply tack coat by brush to contact surfaces of curbs, gutters, manholes, and other structures projecting into or abutting asphalt concrete pavement.
 - 4. Allow to dry until tack coat is at correct tackiness to receive pavement.

5. Where asphaltic concrete will adhere to surface, tack coat may be eliminated by Owner's Representative.

E. Seal Coat

1. Install a slurry seal coat in accordance with Section 37-2, "Slurry Seal", of CalTrans Section 39 Specifications at completion of project.

F. Frame adjustment:

1. Set frames of subsurface structures to final grade; include existing frames and new frames furnished under other work of project.
2. Placing frames:
 - a. Surround frames set to elevation with a ring of compacted asphalt concrete base prior to paving.
 - b. Place asphalt concrete mixture up to 1-inch below top of frame, slope to grade, and compact by hand tamping.
3. Adjust existing and new frames and valve covers to proper position to meet paving.
4. If permanent covers are not in place, provide temporary covers over openings until completion of rolling operations.
5. Set cover frames and valve covers to grade, flush with surface of adjacent pavement.

3.03 INSTALLATION

A. Placement per Caltrans Section 39:

1. Place asphalt concrete mixture on prepared surface, spread, and strike-off using paving machine.
2. Complete pavement over full width of section on each day's run.
3. Minimum temp of 225 degrees F for mixture during placement.
4. Inaccessible and small areas may be placed by hand.
5. Conform to the grade, cross-section, finish thickness, and density indicated.
6. Paver placing:
 - a. Unless otherwise directed, begin placing along centerline of areas on crowned section, and at high side on one-way slope, and in direction of traffic flow.
 - b. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips.
 - c. Complete base courses before placing surface courses.
 - d. Place mixture in as continuous an operation as practicable.
7. Hand placing:
 - a. Spread, tamp, and finish mixture using hand tools in areas where machine spreading is not possible, as acceptable to Owner's Representative.
 - b. Place mixture at a rate that will insure handling and compaction before mixture becomes cooler than acceptable working temperature.
8. Joints:
 - a. Construct transverse joint at right angles to centerline when operations are suspended long enough for mixture to chill.

- b. Construct joints to have same texture, density and smoothness as adjacent sections of asphalt concrete course.
- c. Clean contact surfaces free of sand, dirt, or other objectionable material and apply tack coat.
- d. Offset transverse joints in succeeding courses not less than 24 inches.
- e. Cut back edge of previously placed course to expose an even, vertical surface for full course thickness.
- f. Offset longitudinal joints in succeeding courses not less than 6 inches.
- g. When the edges of longitudinal joints are irregular, honeycombed, or inadequately compacted, cut back unsatisfactory sections to expose an even, vertical surface for full course thickness.
- h. Where the wearing course constructed in even number of strips; place one (1) longitudinal joint on centerline of road.
- i. Where the wearing course is constructed in an odd number of strips; place the centerline of one (1) strip on centerline of road.

B. Compaction:

- 1. Provide rollers to obtain the required pavement density.
- 2. Begin rolling operations when the mixture will bear weight of roller without excess displacement.
- 3. Do not permit heavy equipment, including rollers, to stand on finished surface before it has thoroughly cooled or set.
- 4. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.
- 5. Start rolling longitudinally at extreme lower side of sections and proceed toward center of pavement. Roll to slightly different lengths on alternate roller runs.
- 6. Do not roll centers of sections first under any circumstances.
- 7. Breakdown rolling:
 - a. Accomplish breakdown or initial rolling immediately following rolling of transverse and longitudinal joints and outside edge.
 - b. Operate rollers as close as possible to paver without causing pavement displacement.
 - c. Check crown, grade, and smoothness after breakdown rolling.
 - d. Repair displaced areas by loosening at once with lutes or rakes and filling, if required, with hot loose material before continuing rolling.
- 8. Second rolling:
 - a. Follow breakdown rolling as soon as possible, while mixture is hot and in condition for compaction.
 - b. Continue second rolling until mixture has been thoroughly compacted.
- 9. Finish rolling:
 - a. Perform finish rolling while mixture is still warm enough for removal of roller marks.
 - b. Continue rolling until roller marks are eliminated and course has attained specified density.
- 10. Patching:
 - a. Remove and replace defective areas for full depth of course.
 - b. Cut out and fill with fresh, hot asphalt concrete.
 - c. Compact by rolling to specified surface density and smoothness.
 - d. Cut sides perpendicular and parallel to direction of traffic with edges vertical.

- e. Apply tack coat to exposed surfaces before placing new asphalt concrete mixture.

C. Tolerances:

- 1. Thickness: Variations from drawings:
 - a. Base course: 1/2-inch±.
 - b. Surface course: 1/2-inch±.
 - c. Total combined thickness: $1/2\text{-inch} \pm 1/2 + 1/2 = 1$.
- 2. Surface smoothness:
 - a. Test using a 10-foot straightedge applied perpendicular to direction of trench.
 - b. 1/4-inch per foot from nearest point of contact.
- 3. Elevations:
 - a. Match existing elevations at structures and adjacent existing pavements.
 - b. Adjust and level existing valve boxes, etc. to match final asphalt grade.

D. Line painting per CalTrans Section 39 & 84:

- 1. General: Apply two (2) coats of paint to clean, dry surfaces; do not thin paint.
- 2. Striping and symbols: As shown at asphalt and Portland Cement concrete pavement, walks, stairs and ramps.
- 3. Colors:
 - a. Striping and lettering: White.
 - b. Disabled access: Blue; match Color No. 15090 of Federal Standard 595A.
 - c. Fire lane no parking: Red per County Fire requirements with white lettering.

3.04 FIELD QUALITY CONTROL

A. Field tests:

- 1. Test in-place for density, thickness, and surface smoothness.
- 2. Final surfaces of uniform texture conforming to required grades and cross-sections.
- 3. Take not less than 4-inch diameter pavement specimens for each completed course from locations as directed by Owner's Representative.
- 4. Repair holes from test specimens as specified for patching defective work.

B. Inspection:

- 1. Do not permit pockets or depressions where water may pool.
- 2. Replaced surface to be even with existing pavement.
- 3. Test using a 10-foot straightedge applied perpendicular to direction of trench.
- 4. 1/4-inch per foot from nearest point of contact.

3.05 CLEANING

- A. After completion of paving operations, clean surfaces of excess or spilled asphalt materials to the satisfaction of Owner's Representative.

3.06 PROTECTION

- A. After final rolling, do not permit vehicular traffic on asphalt concrete pavement until it has cooled and hardened, and in no case, sooner than six (6) hours.
- B. Provide barricades and warning devices as required to protect pavement and the general public.
- C. Cover openings of structure in the area of paving until permanent coverings are placed.

END OF SECTION

SECTION 03001

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Cast-in-place concrete.
2. Reinforcing steel.
3. Forms.
4. Concrete accessories.

B. Related sections:

1. Related Work specified elsewhere:
 - a. Demolition: Section 02050
 - b. Earthwork: Section 02200
 - c. Grout: Section 03600
 - d. Anchor Bolts and Expansion Anchors: Section 05501
 - e. Sealants and Caulking: Section 07900

1.02 REFERENCES

A. Reference standards:

1. Latest version of all.
2. ACI 214: Recommended Practice for Evaluating Compression Test Results of Field Concrete.
3. ACI 224: Control of cracking in Concrete Structures.
4. ACI 224.3: Joints in Concrete Construction.
5. ACI 301: Specifications for Structural Concrete.
6. ACI 305: Recommended Practice for Hot Weather Concreting.
7. ACI 306: Recommended Practice for Cold Weather Concreting.
8. ACI 306.1: Standard Specifications for Cold Weather Concreting.
9. ACI 315: Manuals of Standard Practice for Detailing Reinforced Concrete Structures.
10. ACI 318: Building Code Requirements for Reinforced Concrete.
11. ACI 347: Recommended Practice for Concrete Formwork.
12. ACI 350: Environmental Engineering Concrete Structures.
13. ASTM A82: Cold-Drawn Steel Wire for Concrete Reinforcement.
14. ASTM A185: Welded Wire Fabric for Concrete Reinforcement.
15. ASTM A497: Welded Preformed Steel Wire Fabric for Concrete Reinforcement.
16. ASTM A615: Deformed Billet-Steel Bars for Concrete Reinforcing.
17. ASTM C31: Making and Curing Concrete Test Specimens in the Field.
18. ASTM C33: Concrete Aggregate.
19. ASTM C39: Test for Compressive Strength for Cylindrical Concrete Specimens.
20. ASTM C94: Ready-Mixed Concrete.

21. ASTM C127: Test for Specific Gravity and Adsorption of Coarse Aggregate.
22. ASTM C128: Test for Specific Gravity and Adsorption of Fine Aggregate.
23. ASTM C136: Test for Sieve or Screen Analysis of Fine and Coarse Aggregates.
24. ASTM C143: Test for Slump of Portland Cement Concrete.
25. ASTM C150: Portland Cement.
26. ASTM C192: Making and Curing Concrete Test Specimens in the Laboratory.
27. ASTM C231: Test for Air Content of Freshly Mixed Concrete.
28. ASTM C260: Air Entraining Admixtures for Concrete.
29. ASTM C494: Chemical Admixtures for Concrete.
30. ASTM C618: Fly Ash and Raw on Calcined Natural Pozzolans for use in Portland Cement.
31. PS1: Construction and Industrial Grade Plywood (ANSI A199.1).

1.03 SUBMITTALS

- A. Product Data and Shop Drawings:
 1. Reinforcing bar lists and fabrication placement and Drawings.
 2. Product information for all additives, sealers, form ties, form coating, waterstops, and accessories.
 3. Concrete mix design.

1.04 QUALITY ASSURANCE

- A. Tolerances: ACI 301 and ACI 347 as modified herein. In case of conflict ACI 347 governs over ACI 301.
- B. Compliance with the requirements specified herein may necessitate modification to the manufacturer's standard material or equipment.
- C. Concrete mix design:
 1. Contractor to provide and pay for the concrete mix design.
 2. Test the proposed concrete mix for each size and gradation of aggregates and each consistency intended for use in the project.
 3. Aggregates:
 - a. Sample and test according to ASTM C33.
 - b. Determine bulk specific gravity in accordance with ASTM C127 and C128.
 4. Compression tests:
 - a. Prepare two (2) sets of compression test cylinders from each proposed concrete mix, three (3) cylinders per set.
 - b. Test one (1) set of three (3) cylinders at seven (7) days, the other at 28 days.
 - c. Make, cure, and store in accordance with ASTM C192.
 - d. Test in accordance with ASTM C39.
 5. Slump test: ASTM C143.
 6. Total air content: ASTM C231.
 7. Initial set test:
 - a. In accordance with ASTM C403.
 - b. Test at 70 degrees F and 90 degrees F ambient.
 - c. Test at 70 degrees F on mix including specified plasticizing and air entraining admixtures.

- d. Test at 90 degrees F on mix including specified retarding and air entraining admixtures.
- 8. Fly ash: Supplier's chemical composition and physical analysis test.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Storage and protection:

- 1. Cement and fly ash.
 - a. Store in moisture proof enclosures.
 - b. Do not use if caked or lumpy.
- 2. Aggregate.
 - a. Store to prevent segregation and inclusion of foreign materials.
 - b. Do not use the bottom 6 inches of piles in contact with the ground.
- 3. Reinforcing steel: Store on supports that will keep it from contact with the ground.
- 4. Rubber and plastic materials.
 - a. Store in a cool place.
 - b. Do not expose to direct sunlight.
- 5. Sealers, form coatings, etc.
 - a. Store indoors according to manufacturer's request.
 - b. Discard any improperly stored materials.

B. Acceptance at site:

- 1. Prepare a delivery ticket for each load of ready-mixed concrete.
- 2. Truck operator shall hand ticket to Owner's Representative at the time of delivery.
- 3. Ticket to show actual:
 - a. Quantity delivered.
 - b. Actual amount of each material in batch.
 - c. Outdoor temperature in the shade.
 - d. Time at which cement was added.
 - e. Truck, project, and mix design identification number.
- 4. Failure to provide the delivery ticket will be cause to reject the load.

1.06 PROJECT/SITE CONDITIONS

- A. Environmental requirements: See Specification Section 02000

PART 2 - PRODUCTS

2.01 MATERIALS

A. Forms:

- 1. Prefabricated: Simplex "Industrial Steel Frame Forms," Symons "Steel Ply," Universal "Uniform," or equal.
- 2. Plywood: PS1, waterproof resin-bonded, exterior type Douglas Fir; face adjacent to concrete, Grade B or better.
- 3. Fiberboard FS LLL-B-810, Type IX, tempered, waterproof, screen back, concrete form hardboard.

4. Lumber: Straight; uniform width and thickness; and free from knots, offsets, holes, dents, and other surface defects.
5. Form coating: Industrial lubricants "Nox-crete Form Coating," W. R. Meadows "Durogard," PRECO "Reebol Form Cote," or equal.
6. Form ties: Removable end, permanently embedded body type not requiring auxiliary spreaders, with cones on outer ends, embedded portion 1-inch minimum back from concrete face. If not provided with threaded ends, then they shall be constructed for breaking off ends without damage to concrete.

B. Reinforcing steel:

1. Bars: ASTM A615, Grade 60.
2. Beam stirrups and column ties: ASTM A615, Grade 40.
3. Welded wire fabric: ASTM A185 or A497.
4. Bar supports: PS7; CRSI Class B or E, fabricated from galvanized wire or having stainless steel legs.

C. Concrete:

1. Cement: ASTM C150, Type II or Type II LA.
2. Fly ash: ASTM C618, Class F, except loss on ignition not more than 5 percent.
3. Fine aggregate: clean, natural sand ASTM C33, or natural materials processed to conform to ASTM C33.
4. Coarse aggregate: crushed rock, natural gravel, or other inert granular material, ASTM C33 except clay and shale particles no more than 1 percent.
5. Water: clean and free of deleterious substances.
6. Admixtures:
 - a. Retarder: ASTM C494, Type D; Grace "Duratard-HC," Master Builders "Pozzoloth 300-R," Protex "Protard," Sika Chemical "Plastiment".
 - b. Plasticizer: ASTM C494, Type A; Grace "Daracem-100," Master Builders "Rheobuild 1000".
 - c. Air entraining agent: ASTM C260; Grace "Darex AEA," Master Builders "Micro-Air," W. R. Meadows "Sealtight".
 - d. Water reducer: Master Builders "Pozzoloth 322N.
 - e. Or equal."

D. Accessories:

1. Waterstops:
 - a. Dumbbell type: Rubber or PVC 6" wide, 3/8" thick with 3/4" bead on each edge, Grace, U.S. Rubber, Williams, Vulcan, Vinylex, Greenstreak, W.R. Meadows.
 - b. Ribbed or serrated: Rubber or PVC, 6" wide, 3/8" thick, with "U" or "O" bulb closed center section, W.R. Meadows "Sealtight Type 6380," Vinylex "RB6-38:," Grace, U.S. Rubber, Williams, Greenstreak 732, Vulcan 8015.
 - c. Hydrophilic strip: Adeka Ultraseal "MC-2010M," American Colloid Company "Waterstop-RX." For use only where specifically called for.
 - d. For expansion joints use Greenstreak 700, Greenstreak "Hydrotite". Hydrophilic strips are not allowed for use in expansion joints.
 - e. For attaching new construction to old: Greenstreak 609, Earthshield Retrofit System or equal.

2. Expansion material:
 - a. Sponge rubber expansion joint filler, ASTM 1501-71, ASTM D1752-83, Type 1.
 - b. Acceptable manufacturers:
 - 1) W.R. Meadows.
 - 2) Epoxy Industries Inc.
 - 3) Sonneborn.
 - 4) Or equal.
3. Aluminum oxide aggregate: "Alumdum," "Emerumdum," or equal, uniformly graded from 100 percent retained on a No. 50 sieve to 100 percent passing a No. 8 sieve.
4. Epoxy bond coat: W. R. Meadows, "Intralok," Grace "Duraweld-C," Sika "Armatec," Permagile Industries, Inc., 1-215 HM; Poly Carb, Mark-25-3, or equal.

2.03 MIXES

- A. Design concrete mix within limits specified.
- B. Comply with ASTM C94.
- C. Cement content:

1. Minimum Portland Cement, lbs/cu yd, for concrete containing a water reducing admixture:

Concrete Slump	Coarse Aggregate Size No. 4 Sieve to 1" Aggregate (Thrust Blocks)	Coarse Aggregate Size from No. 4 Sieve to			Concrete Toppings <u>3/8"</u>	Controlled Density Fill <u>3/8"</u>
		<u>1/2"</u>	<u>3/4"</u>	<u>1"</u>		
4"	542	611	583	555	700	-
6"	-	-	-	-	-	275

2. If water reducing admixture is omitted, increase cement content 10 percent.
3. Contractor may substitute fly ash for up to 15 percent of cement at a rate of 1.5 lbs fly ash for each 1 lb of cement.

- D. Water cement ratio:

1. For containment structures: The water cement ratio shall not exceed 0.45. If fly ash is used the cement-plus-fly ash ratio (W/C+F) shall not exceed 0.40.
2. For non-containment structures and thrust blocks: The water cement ratio w/c shall not exceed 0.50.
3. Controlled density fill shall be a mixture of cement, Class F Pozzolan and coarse aggregate. The 3/8-inch coarse aggregate shall not exceed 25 percent of total aggregate. Air entrainment is required. Water cement ratio W/C shall not exceed 0.50.

- E. Slump:

1. Containment structures: Maximum 4-inch slump.

2. Other Structures and thrust blocks: Maximum 6-inch slump.
3. Controlled density fill: Maximum 6-inch slump.

F. Volume ratio of fine to total aggregates:

<u>Coarse Aggregate Size</u>	<u>Minimum Ratio</u>	<u>Maximum Ratio</u>
3/8"	0.45	0.50
1/2"	0.40	0.50
3/4"	0.35	0.50
1"	0.30	0.46
1-1/2"	0.25	0.42

G. Initial set:

1. 5-1/2 hours $\pm$ 1 hr after water and cement are added to the aggregates as determined by ASTM C403.
2. Adjust retarder quantities to compensate for temperature and job condition variations.

H. Volumetric air content, all Concrete: 6 percent $\pm$ 1 percent after placement.

I. Admixtures:

1. Content, batching method, and time of introduction in accordance with the manufacturer's recommendations for compliance with this specification.
2. Include a water reducing admixture.
3. Calcium chloride is not permitted.
4. Superplasticizer may be required. A separate submittal and approval are required

J. Strength: Minimum compressive strength as determined by ASTM C39 for concrete structures:

<u>Age</u>	<u>Concrete Structures Minimum Strength</u>	<u>Thrust Block Minimum Strength</u>	<u>Controlled Density Fill</u>	
			<u>Non-Structural Minimum Strength</u>	<u>Structural Minimum Strength</u>
7 days	2,500 psi	2,000 psi	-	-
28 days	3,000 psi	3,000 psi	100 psi	1,200 psi

K. Consistency:

1. Suitable for the placement conditions.
2. Slump uniform.
3. Aggregate floating uniformly throughout the concrete mass.
4. Flow sluggishly when vibrated or spaded.

2.04 SOURCE QUALITY CONTROL

A. Test reports:

1. Submit reports of tentative concrete mix design and testing including:
 - a. Slump on which the design is based.
 - b. Total gal of water per cu yd.
 - c. Brand, type, composition, and quantity of cement.
 - d. Brand, type, composition, and quantity of fly ash.
 - e. Specific gravity and gradation of each aggregate.
 - f. Ratio of fine to total aggregates.
 - g. Surface-dry weight of each aggregate per cu yd.
 - h. Brand, type, ASTM designation, active chemical ingredients and quantity of each admixture.
 - i. Air content.
 - j. Compressive strength based on 7 day and 28 day compression tests.
 - k. Time of initial set.
2. Submit suppliers certified fly ash test reports for each shipment delivered to concrete supplier.
 - a. Physical and chemical characteristics.
 - b. Certification of compliance with the specifications.
 - c. Signed by Contractor and concrete supplier.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Forms:

1. Design to produce hardened concrete to the shape, lines, and dimensions indicated on the Drawings.
2. Conform to ACI 347 as modified herein.
3. Surfaces exposed to view.
 - a. Prefabricated plywood panel forms, job-built plywood forms, or forms lined with plywood or fiberboard.
 - b. Laid out in a regular and uniform pattern with long dimensions vertical and joints aligned.
 - c. Produce finished surfaces free from offsets, ridges, waves, and concave or convex areas.
 - d. Maximum deviation from a true plane: 1/8-inch in 6 feet.
4. Plywood or lined forms are not required for surface (buried by backfill) not normally submerged or not normally exposed to view.
5. Other types of forms may be used:
 - a. For surfaces not restricted to plywood or lined forms.
 - b. As backing for form lining.
6. Provide forms above all extended footings.
7. When placing concrete against gravel or crushed rock not containing 25 percent minimum material passing a No. 4 sieve:
 - a. Provide polyethylene film to protect concrete from water loss.
 - b. Lap joints 4 inches.

8. Provide substantial forms sufficiently tight to prevent leakage of mortar.
9. Brace or tie forms to maintain desired position, shape, and alignment during and after concrete placement.
10. Size and space walers, studs, internal ties and other form supports so proper working stresses are not exceeded.
11. Form concrete column supported beams and slabs so column forms may be removed without disturbing beam and slab form supports.
12. Where the top of a wall will be exposed to weathering, stop form on at least one side at true line and grade.
13. Other locations to be finished to a specified elevation, slope, or contour, bring form to true line and grade and provide a wooden guide strip at the proper location in the forms for finishing the top surface with a screed or template.
14. At horizontal construction joints in walls, stop the forms on one side not more than 2 feet above the joint.
15. Provide temporary opening at the bottom of columns and wall forms and wherever necessary for cleaning and inspection.
16. Install form ties on exposed surfaces in uniformly spaced vertical and horizontal rows.
17. Provide chamfer strips.
 - a. To bevel salient edges and corners.
 - b. To bevel salient edges of equipment bases.
 - c. 3/4-inch bevel.
18. Do not remove or disturb until concrete has attained sufficient strength to safely support all dead and live loads.
19. Leave shoring beneath beams and slabs in place and reinforce as required by construction equipment and materials.
20. Remove forms carefully to prevent surface gouging, corner or edge breakage and other damage.

B. Reinforcing steel:

1. Accurately position reinforcing steel on supports, spacers, hangers, or other reinforcing steel.
2. Secure with wire ties or suitable clips.
3. Except at contact splices, minimum clear distance between bars, is to be the greater of:
 - a. Nominal diameter of bars.
 - b. 1.5 times maximum size of coarse aggregate.
 - c. 1-1/2 inch in columns.
 - d. 1-inch in beams.
 - e. 2 inches in other locations.
4. Where beam reinforcement is placed in 2 layers, place bars in upper layer directly above bars in lower layer.
5. Do not install reinforcement for beams and slabs that are supported by concrete columns until after the concrete for the column has been placed.
6. Fabricate in accordance with ACI 315 and ACI 318 except as specified or indicated on Drawings.
7. Accurately formed.
8. Free from loose rust, scale, and contaminants that will reduce bond.
9. Splices:
 - a. As indicated on the Drawings.

- b. Do not weld or tack weld reinforcing steel except where specifically indicated on Drawings.
 - c. Remove and replace steel upon which any unauthorized welding has been performed.
- 10. Do not bend or re-bend reinforcing steel at job site. Bending of steel in locations not shown on Drawings shall be cause for rejection of work.

C. Embedments:

- 1. Accurately position and securely anchor in forms all anchor bolts, castings, steel shapes, conduit, sleeves, masonry anchorages, and other materials to be embedded in concrete.
- 2. Anchor bolts:
 - a. Provide sufficient threads on anchor bolts to permit a nut on the concrete side of the form or template.
 - b. Install a second nut on the other side of the form or template.
 - c. Adjust the nuts to hold the bolt rigidly in the proper position.
- 3. Clean embedments before installation.
- 4. Clean concrete spatter and other foreign substances from surfaces not in contact with concrete.
- 5. Protect the threads of anchor bolts from damage and concrete splatter during construction.

D. Concrete:

- 1. Notify Owner's Representative not less than 24 hours in advance of the times and places at which Contractor intends to place concrete.
- 2. Predetermine limits of each pour.
- 3. Place all concrete within limits of pour in one (1) continuous operation.
- 4. Rigidly secure forms, reinforcing steel, water stops, and anchor bolts in proper position.
- 5. Remove all mud, water, and debris from space to be occupied by concrete.
- 6. Clean surfaces encrusted with dried concrete from previous concrete operations.
- 7. Bonding to hardened concrete:
 - a. Place new concrete on rough, clean, damp faces of existing concrete.
 - b. Remove surface mortar to expose aggregate.
 - c. Clean hardened concrete of all foreign substances, including curing compound.
 - d. Wash with clean water, and keep saturated for 24 hours preceding placement of fresh concrete.
- 8. Epoxy bonding:
 - a. Apply epoxy bonding agent per manufacturer's recommendation on surfaces identified on the Drawings.
- 9. Conveying concrete:
 - a. Convey to the point of final deposit by methods that will prevent separation or loss of ingredients.
 - b. Place concrete in final position without being moved laterally more than 5 feet.
- 10. Placing concrete:
 - a. Place concrete in approximately horizontal layers of proper depth for proper compaction, not more than 2 feet.

- b. Place subsequent layer while the preceding layer is still plastic.
 - c. Fill form at a rate not less than 2 ft/hr.
 - d. Do not allow concrete to free fall more than 4 feet in walls and columns.
 - e. Provide vertical construction joints as required to comply with these requirements and as shown on the Drawings.
 - f. Place and compact concrete in wall or column forms before placing any reinforcing steel in the system to be supported by the walls and columns.
 - g. Limit portions of columns and walls poured monolithically with floor on roof slabs to 6-foot vertical height.
 - h. Allow concrete in walls and columns to settle at least two (2) hours before concrete is placed in structural systems to be supported by the walls and columns.
 - i. Top finish concrete when thoroughly settled.
 - j. Remove all laitance, debris, and surplus water from the tops of the forms by screeding, scraping, or other effective means.
 - k. Overfill the forms for walls whose tops will be exposed to the weather and screed off the excess after the concrete has settled.
11. Compaction:
- a. Thoroughly compact concrete during and immediately after placement.
 - b. Work concrete around all reinforcements and embedments and into the corners of the forms.
 - c. Use mechanical vibrators which will maintain 9,000 cycles/min when immersed in the concrete, 1-1/2 hp motor min.
12. Cold weather concreting:
- a. Comply with ACI 306 and 306.1, except as modified herein.
 - b. Minimum concrete temperature at the time of mixing:
- | | |
|--|---|
| <u>Outdoor Temperature
at Placement (in shade)</u> | <u>Concrete Temperature
at Mixing</u> |
| Below 0° F | 70° F |
| Between 0° F & 30° F | 65° F |
| Between 30° F & 45° F | 60° F |
| Above 45° F | 45° F |
- c. Do not place heated concrete which is warmer than 80 degrees F.
 - d. If freezing temperatures are expected during curing, maintain the concrete temperature at or about 50 degrees F for five (5) days or 70 degrees F for three (3) days.
 - e. Do not allow concrete to cool suddenly.
 - f. Do not place concrete on frozen subgrade.
13. Hot weather concreting:
- a. Comply with ACI 305, except as modified herein.
 - b. If the air temperature is expected to be 85 degrees F or greater in the next 24 hours.
 - 1) Keep concrete as cool as possible before, during, and after placement.
 - 2) Do not allow concrete temperature to exceed 80 degrees F at placement.
 - 3) Prevent plastic shrinkage cracking due to rapid evaporation of moisture.
 - 4) Addition of ice, or other cooling methods, will be required to meet temperature requirements.

- c. Do not place concrete when the actual or anticipated evaporation rate equals or exceeds 0.2 lbs/sq ft/hr as determined from ACI 305.

E. Construction joints:

1. Locations:

- a. As indicated on the Drawings, and if not shown, joint spacing shall not exceed ACI recommendations as interpreted by the Engineer.
- b. In columns and walls:
 - 1) At the underside of beams, girders, haunches, drop panels, column capitals, and at floor panels.
 - 2) Haunches, drop panels, and column capitals are considered part of the supported floor or roof and shall be placed monolithically therewith.
 - 3) Column bases need not be placed monolithically with the floor below.
- c. In beams and girders:
 - 1) At the middle of the span unless a beam intersects a girder at this point.
 - 2) If the middle of the span is at an intersection of a beam and girder, offset the joint in the girder a distance equal to twice the beam width.
 - 3) Provide satisfactory means for transferring shear and other forces through the construction joint.
- d. In suspended slabs:
 - 1) At or near the center of span in flat slab or T-beam construction.
 - 2) Do not locate a joint between a slab and a concrete beam or girder unless so indicated on the Drawings.
- e. Install construction joints in beams, slabs, and girders perpendicular to the planes of their surfaces.

2. Watertight joints:

- a. Provide watertight joints with continuous waterstops at the following locations.
 - 1) Walls in contact with liquid where the opposite face is above finished grade or exposed in a dry pit or room.
 - 2) Slabs in contact with liquid where the opposite face is exposed in a dry pit or room.
 - 3) Other locations indicated on Drawings.
 - 4) Expansion and construction joints.
 - 5) Hydrophilic waterstops are only to be used where specifically shown on Drawings.

F. Expansion and contraction joints:

1. Contraction joints:

- a. Provide as indicated on Drawings.
- b. Seal accessible edges.
- c. Waterstop embedment equal on each side of the joint.
- d. Splice water stops in strict conformity with the manufacturer's instructions.

2. Expansion material:

- a. Provide as indicated on Drawings.
- b. Firmly bond to previously poured joint. Face with a suitable adhesive.
- c. Pour new concrete directly against joint filler.
- d. Seal accessible edges.

G. Finishing unformed surfaces:

1. Do not finish buried or permanently submerged concrete not forming an integral part of a structure except as required to attain surface elevations, contours, and freedom from laitance.
2. Screed and initial float finish followed by additional floating, and troweling as required, all other surfaces.
3. Screeding:
 - a. Screed concrete surfaces to the proper elevation and contours with all aggregates completely imbedded in mortar.
 - b. Surface free of irregularities of height or depth more than 1/4 inch measured from a 10-foot straightedge.
4. Floating:
 - a. Float finish screeded surfaces as soon as the concrete has stiffened sufficiently for working.
 - b. Remove and replace with mortar any coarse aggregate which is disturbed by the float or which causes a surface irregularity.
 - c. Initial floating to produce a surface of uniform texture and appearance without unnecessary working of the surface.
 - d. Follow initial floating with a second floating at the time of initial set.
 - e. Second floating to produce a finish of uniform texture.
 - f. Except as otherwise specified, the second floating finish is the final finish.
 - g. Use hand floats or mechanical compactor floats.
5. Broom finish:
 - a. Broom finish exterior slabs.
 - b. Broom after second floating and at right angles to normal traffic.
6. Troweling:
 - a. Steel trowel finish interior floor surface which will be exposed at the completion of construction, the exposed portion of the equipment bases, interior curbs, and where indicated on the Drawings.
 - b. Do not trowel floor surfaces which will be normally submerged.
 - c. Trowel after the second floating when the surface has hardened adequately to prevent drawing an excess of fines to the surface.
 - d. Trowel to produce a dense, smooth, uniform surface free from blemishes and trowel marks.
7. Aggregate exposure:
 - a. Remove surface mortar from surfaces to be covered later with concrete or mortar topping.
 - b. Expose coarse aggregates to improve bonding.
8. Unless specified to be beveled, edge floated or troweled surfaces with a tool having a 1/4-inch radius.

H. Curing:

1. Protect concrete from moisture loss for at least seven (7) days after placement except that the time period for curing by saturation for concrete being protected from low temperature shall be one day less than the duration of low temperature protection.
2. Cure concrete by methods that will keep concrete surfaces adequately wet during curing.
3. Water curing:
 - a. Begin water saturation as quickly as possible after initial set.

- b. Regulate water application to provide complete surface coverage with a minimum of runoff.
 - c. Use absorptive blankets to hold moisture to concrete or flood the surface.
 - d. The floor slabs and the concrete toppings in the Primary and Secondary Clarifiers, as well as the suspended slabs and channel walls of the Primary Pump Station, shall be water cured (submerged or absorptive blankets).
- 4. Membrane curing:
 - a. Membrane curing compound may be used in lieu of water curing on concrete which will not be covered later with mortar or concrete where water curing is not specifically called for.
 - b. Spray apply membrane curing compound at not more than 300 sq ft/gal.
 - c. Cover unformed surfaces within 30 minutes of final finishing.
 - d. If forms are removed before the end of the curing period, immediately apply curing compound to the formed surfaces before they dry out.
 - e. Protect curing compound against abrasion during the curing period.
- 5. Film curing:
 - a. Polyethylene sheeting may be used in lieu of water curing on concrete which will be covered later with mortar or additional concrete, or will otherwise be covered or hidden from view where water curing is not specifically called for.
 - b. Begin film curing as quickly after initial set of the concrete as possible.
 - c. Completely cover the surfaces with polyethylene sheeting.
 - d. Overlap the sheeting edges for sealing and anchorage.
 - e. Seal joints between sheets.
 - f. Promptly repair tears, holes, and other damages.
 - g. Anchor covering continuously at edges and on the surfaces as required to prevent billowing

I. Finishing formed surfaces:

- 1. Remove fins and other surface projections from all formed surfaces except exterior surfaces that will be in contact with earth backfill and are not specified to be dampproofed.
- 2. Use a power grinder, if necessary, to remove projections and provide a flush surface.
- 3. Remove fins and fill tie hole on surfaces to be dampproofed but do not do any other finishing of those surfaces.
- 4. Tie holes:
 - a. Clean, wet and fill with patching mortar.
 - b. Finish flush to match the texture of adjacent concrete.
- 5. Grout - cleaned finish:
 - a. ACI 301, 5.3.3.4.b.
 - b. Grout clean surfaces to produce a smooth uniform surface free of marks, voids, surface glaze, and cement dust.
 - c. Grout clean all surfaces exposed to view, interior of tanks and surfaces indicated on Drawings.
 - d. Fill all voids, regardless of location, that are 1/4-inch deep or 1/2-inch diameter.

3.02 FIELD QUALITY CONTROL

A. Owner's Representative furnished:

1. Perform field control test:
 - a. Tests by qualified personnel.
 - b. Make tests in presence of Owner's Representative.
 - c. Provide all equipment, supplies, and the services of one (1) or more employees, as required.
 - d. The test frequencies specified are minimum, perform additional tests as required by the job conditions.
2. Aggregate gradation: Sample and test in accordance with ASTM D75 and C136.
 - a. Fine aggregates: Each 100T.
 - b. Coarse aggregates: Each 200T.
3. Fly ash: Sample and test each 25T in accordance with ASTM C143.
4. Slump: perform a test for each truck load in accordance with ASTM C143.
5. Air content: Test a sample from one the first three batches made each day in accordance with ASTM C231.
6. Compression tests:
 - a. Make one (1) set of four (4) cylinders from each truck load.
 - b. Test one (1) cylinder in each set at SEVEN (7) days.
 - c. Test two (2) cylinders in each set at 28 days.
 - d. The other cylinder is to be a spare to be tested at the Owner's Representative's discretion.
 - e. Owner's Representative will evaluate in accordance with ACI 214 and ACI 318.
 - f. Make cure, store, and deliver cylinders in accordance with ASTM C31.
 - g. Test in accordance with ASTM C39.
 - h. Mark or tag each set of test cylinders with the date and time of day the cylinders were made, the location in the work where the concrete represented by the cylinders was placed, the delivery truck or batch number, the air content, and the slump.

B. Contractor furnished:

1. Provide materials from each truck for test cylinders.
2. Cooperate with testing agency to provide test prior to placement of each load.
3. Provide all mix design testing.
4. Pay for all retesting of concrete which does not meet specifications during the initial test.

C. Contractor furnished concrete basin and hydraulic structures leakage test:

1. Concrete shall meet 28-day strength prior to testing.
2. Field test all basins for leakage per ACI 350R.
3. Fill basins with water.
4. Provide all pumping, pipes, etc. required.
5. Maintain water level to weirs or to maximum operating level for a period of 2 hours minimum.
6. Observe for visible leaks and loss of water after the initial loss due to absorption by the structure.
7. For water containing structures with above-grade finish exterior, all cracks and joints shall be sealed to eliminate any seepage.

8. Test level to be the weir elevation or the level as determined by the Owner's Representative.
9. Drain and refill if repair is required as many times as necessary to provide a watertight structure.
10. After the test is complete and approved by the Owner's Representative, dispose of the water per County requirements. Coordinate with the Owner's Representative.

END OF SECTION

SECTION 03600

GROUT

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Grouting of column and equipment baseplates.
2. Grouting of anchors and dowels into existing concrete.
3. Patching cavities in concrete and CMU wall penetrations.
4. Other grouting specified or indicated on Drawings.

B. Related sections:

1. Related Work specified elsewhere:
 - a. Cast-In-Place Concrete: Section 03001
 - b. Anchor Bolts and Expansion Anchors: Section 05501
 - c. Miscellaneous Metal: Section 05999

1.02 REFERENCES

A. References standards:

1. Corps of Engineers Specifications CRD-C-621: Specification for Non-Shrink Grout.
2. ASTM C-827: Hardened Volume Change.
3. ASTM C-307: Tensile Strength.
4. ASTM C-579: Compressive Strength.
5. ASTM C-882: Bond Strength.
6. ASTM C33: Concrete Aggregates.
7. ASTM C109: Test Method for Compressive Strength of Hydraulic Cement Mortars (using 2-inch or 50mm cube specimens).
8. ASTM C143: Test Method for Slump of Portland Cement Concrete.
9. ASTM C150: Portland Cement.
10. ASTM C172: Method of Sampling Freshly Mixed Concrete.
11. ASTM C231: Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
12. ASTM C260: Air-Entraining Admixtures for Concrete.
13. ASTM C494: Specification for Chemical Admixtures for Concrete.
14. ASTM C595: Blended Hydraulic Cements.
15. ASTM C827: Test Method for Early Volume Change of Cementitious Mixtures.
16. ACI 211.1: Standard Practice for Selecting Proportions for Normal and Heavyweight, and Mass Concrete.
17. ACI 301: Specifications for structural concrete.

1.03 SUBMITTALS

- A. Product Data:
 - 1. Copies of manufacturer's specifications and installation instructions for all proprietary materials.
 - 2. Certification that materials meet specification requirements.
 - 3. For ordinary cement grout, submit copies of grout design mix and laboratory test reports for grout strength tests.
- B. Quality control submittals:
 - 1. Test reports: Submit proportioning mix design report.

1.04 QUALITY ASSURANCE

- A. Compliance with the requirements specified herein may necessitate modification to the manufacturer's standard material or equipment.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver and store material in manufacturer's original, unopened, undamaged containers.
- B. Store in dry areas protected from moisture and wet weather.
- C. Store away from traffic areas.

1.06 PROJECT/SITE CONDITIONS

- A. Environmental requirements: See Specification Section 02000

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Non-shrinking non-metallic grout: Master Builders "MF-928 Grout;" W. R. Meadows "588 Grout;" U. S. Grout "Five Star Grout, 100 Series;" or equal.
 - 1. Factory pre-mixed requiring only water addition in the field.
- B. Epoxy grout:
 - 1. Adhesive: Master Builders "Ceilcote HT648 Grout," Minwax, "POR-ROK," Exxon Chem Co., "Escoweld 2505," Sika "Sikadur Hi-Mod," or equal.
 - 2. Aggregate: Master Builders "Ceilcote HT648," Exxon Chem Co., "Escoweld 2510," Sika "Colma Quartzite Aggregate," or equal.
 - 3. Three-component epoxy resin system.
 - a. Two (2) liquid epoxy components.

- b. One (1) inert aggregate filler component.
 - 4. Each component furnished in separate package for mixing at job site.
- C. Water: Clean and free from deleterious substances.
- D. Ordinary cement-type grout: Prepare design mixes of ordinary cement grout. Mixes subject to the following limitations:
 - 1. Cement:
 - a. Portland Cement, ASTM C150, Type II, or blended hydraulic cement, ASTM C595, Type 1P.
 - b. Use Portland cement made by a well known acceptable manufacturer and produced by not more than one plant.
 - c. Do not use cement which has deteriorated because of improper storage or handling.
 - 2. Aggregates: ASTM C33 and as herein specified:
 - a. Do not use aggregates containing soluble salts or other substances such as iron sulfides, pyrite, marcasite, ochre, or other materials that can cause stains on exposed concrete surfaces.
 - b. Fine aggregate: Clean, sharp, natural sand free from loam, clay, lumps or other deleterious substances.
 - c. Coarse aggregate: Clean, uncoated, processed aggregate containing no clay, mud, loam, or foreign matter, as follows:
 - 1) Crushed stone, processed from natural rock or stone.
 - 2) Washed gravel, either natural or crushed. Use of slag and pit or bank run gravel is not permitted.
 - 3) Coarse aggregate size: Size to be ASTM C33, No. 8 for coarse grout.
 - 3. Water: Clean, free from injurious amounts of oils, acids, alkalis, organic materials or other substances that may be deleterious to concrete or steel.
 - 4. Admixtures: Provide admixtures produced by established reputable manufacturers, and use in compliance with the manufacturer's printed instruction. Do not use admixtures that have not been incorporated and tested in the accepted mixes, unless otherwise authorized in writing by the District Representative. Provide admixtures as follows:
 - a. Air-entraining admixtures: Provide one of the following products and manufacturer that meets ASTM C260:
 - 1) Sika AER by Sika Chemical Corporation.
 - 2) Micro-Air by Master Builders Company.
 - 3) Or equal.
 - b. Water-reducing admixture: Proportion all grout with non-air entraining, normal setting, water-reducing, aqueous solution of a modification of the salt of polyhydroxylated organic acids. The admixture shall not contain any nitrates, or chlorides added during manufacture. Provide one (1) of the following that meets ASTM C494, Type A. Set-control admixtures may be used where the use of the admixture will enhance the placement of grout while maintaining the required strength and durability:
 - 1) Eucon WR-75 by the Euclid Chemical Company.
 - 2) Pozzolith 300-N by Master Builders Company.
 - 3) Or equal.
 - 5. Proportioning and design of mixes: Mixes subject to the following limitations:
 - a. Coarse grout:

- 1) Twenty-eight day compressive strength: 4000 psi.
- 2) Maximum water-cement ratio by weight: 0.45.
- 3) Fine and coarse aggregate size No. 8 meeting ASTM C33.
- 4) Air content percentage: 6+/-1 percent.
- 5) Minimum cement content in pounds per cubic yard: 755.
6. Use an independent testing company acceptable to the District Representative for preparing and reporting proposed mix designs.
7. Proportion mixes by either laboratory trial batch or field experience methods, using materials to be employed on the Project for grout required. Comply with ACI 211.1 and report to the Construction Manager the following data:
 - a. Complete identification of aggregate source of supply.
 - b. Tests of aggregates for compliance with specified requirements.
 - c. Scale weight of each aggregate.
 - d. Absorbed water in each aggregate.
 - e. Brand, type, and composition of cement.
 - f. Brand, type, and amount of each admixture.
 - g. Amounts of water used in trial mixes.
 - h. Proportions of each material per cubic yard.
 - i. Gross weight and yield per cubic yard of trial mixtures.
 - j. Measured slump.
 - k. Measured air content.
 - l. Compressive strength developed at seven (7) days and 28 days, from not less than three (3) test specimens cast for each 7-day and 28-day test, and for each design mix.
8. Submit written reports to the District Representative of proposed mix of grout at least 30 days prior to start of Work. Do not begin grout production until mixes have been accepted by the District Representative.
9. Laboratory trial batches: When laboratory trial batches are used to select grout proportions, prepare test specimens and conduct strength tests as specified in ACI 301, Chapter 4 - Proportioning.
10. Field experience method: When field experience methods are used to select grout proportions, establish proportions as specified in ACI 301, Chapter 3.
11. Admixtures: Use air-entraining admixture in all grout. Add air-entraining admixture at the manufacturer's prescribed rate to result in grout at the point of placement having air content within the prescribed limits. Use amounts of admixtures as recommended by the manufacturer for climatic conditions prevailing at the time of placing. Adjust quantities and types of admixtures as required to maintain quality control. Do not use admixtures that have not been incorporated and tested in the accepted design mix, unless otherwise authorized in writing by the District Representative.
12. Slump limits: Proportion and design mixes to result in grout slump at the point of placement of not more than four (4) inches.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine the areas and conditions under which grout is to be installed.

- B. Notify the District Representative of conditions detrimental to the proper and timely completion of the Work.
- C. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Non-shrinking, non-metallic grout:
 - 1. Clean concrete surface to receive grout.
 - 2. Saturate concrete with water for 24 hours prior to grouting.
 - 3. Place in accordance with manufacturer's instructions.
- B. Epoxy grout:
 - 1. Mix and place in accordance with manufacturer's instructions.
 - 2. Completely fill all cavities and spaces around dowels and anchors without voids.
 - 3. Grout base and baseplates as specified for non-shrinking, non-metallic grout.
 - 4. Obtain manufacturer's field technical assistance as required to insure proper placement.

3.03 APPLICATION

- A. Non-shrinking non-metallic grout:
 - 1. Mix in a mechanical mixer.
 - 2. Use no more water than necessary to produce flowable grout.
 - 3. Place in accordance with manufacturer's instructions.
 - 4. Completely fill all spaces and cavities below the top of baseplates.
 - 5. Provide forms where baseplates and bedplates do not confine grout.
 - 6. Where exposed to view, finish grout edges smooth.
 - 7. Except where a slope is indicated on the Drawings, finish edges flush at the baseplate, bedplate, member or piece of equipment.
 - 8. Wet cure grout for seven (7) days minimum.
 - 9. Protect against rapid moisture loss by covering with wet rags or polyethylene sheets.
- B. Epoxy grout:
 - 1. Mix and place in accordance with manufacturer's instructions.
 - 2. Completely fill all cavities and spaces around dowels and anchors without voids.

3.04 FIELD QUALITY CONTROL

- A. General:
 - 1. District Representative will employ a testing laboratory to perform field quality control testing on ordinary cement-sand grout.
 - 2. District Representative will direct the number of tests and cubes required.
 - 3. The testing laboratory will make standard compression test cubes and entrained air tests as specified.

4. Furnish all necessary assistance required by the District Representative.

B. Quality control testing during construction:

1. Sampling and testing for field quality control will be performed by the testing laboratory during the placement of cement-sand grout, as follows:
 - a. Sampling Fresh Grout: ASTM C172.
 - b. Slump: ASTM C143; one (1) test for each grout load at point of discharge from the vender's delivery vehicle; and one (1) for each set of compressive strength specimens.
 - c. Air content: ASTM C231; one (1) for every other grout load at point of discharge from the vender's delivery vehicle, or when required by an indication of change as determined by the Construction Manager.
 - d. Compressive strength tests: ASTM C109; one (1) set of compression cubes for each 50 cubic yards or fraction thereof, of each mix design placed in any one (1) day or for each 2,500 square feet of surface area placed, whichever provides more cubes. Break one (1) specimen tested at seven (7) days; break two (2) specimens tested at 28 days; and break one (1) specimen tested at the direction of the Construction Manager.
 - 1) Adjust mix if test results are unsatisfactory and resubmit for review.
 - 2) Grout that does not meet the strength requirements is subject to rejection and removal from the Work at the expense of the Contractor.
- 3) The Contractor shall provide all samples required for testing at no additional costs to the Owner.
 - e. Compression test specimens:
 - 1) ASTM C109; the testing laboratory will take a minimum of one (1) set of four (4) standard cubes for each compressive strength test, unless otherwise directed by the District Representative.
 - f. Grout temperature: Test hourly when air temperature is 40 degrees F and below, and when 80 degrees F and above; and each time a set of compression test specimens is made. Comply with the requirements of Section 03001 for Cold and Hot Weather Placement.
 - g. Shrinkage: ASTM C827.
2. The testing laboratory will submit certified copies of test results directly to the District Representative, who will forward copies to the Contractor.

C. Evaluation of quality control tests:

1. Do not use grout delivered to the final point of placement that has slump, temperature, or total air content outside the specified values.
2. Compressive strength tests for laboratory-cured cubes will be considered satisfactory if the averages of all sets of three (3) consecutive compressive strength test results equal or exceed the 28-day design compressive strength of the type of grout.
3. If the compressive strength tests fail to meet the minimum requirements specified, the grout represented by such tests will be considered deficient in strength and subject to removal, replacement, reconstruction, or to other action required, all at no additional cost to the Owner.

3.05 SCHEDULES

- A. Non-shrinking, non-metallic grout: general use, baseplates, equipment bases, pipe entrance to precast vaults, pipe supports, wall penetrations, etc., unless noted otherwise.
- B. Epoxy grout:
 - 1. Patching cavities in concrete.
 - 2. Grouting of dowels and anchor bolts into existing concrete.
 - 3. Other uses indicated on Drawings.

END OF SECTION

SECTION 05501

ANCHOR BOLTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Equipment anchor bolts.
 - 2. Structural anchor bolts.
 - 3. Expansion anchors (Not Allowed).
 - 4. Epoxy set anchor bolts.
- B. Related sections:
 - 1. Related Work specified elsewhere:
 - a. Cast-in-Place Concrete: Section 03001
 - b. Grout: Section 03600
 - c. Miscellaneous Metal: Section 05999

1.02 REFERENCES

- A. Reference standards:
 - 1. ASTM A307: Carbon Steel Externally Threaded.
 - 2. ASTM A153: Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 3. ASTM A164: Electrodeposited Coatings of Zinc on Steel.
 - 4. ASTM A120: Pipe, Steel, Black and Hot-Dipped, Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses.
 - 5. ASTM A36: Structural Steel.
 - 6. ASTM A276: Stainless Steel.
 - 7. ANSI B94.12: Epoxy Set Anchors.

1.03 SYSTEM DESCRIPTION

- A. Contractor's option:
 - 1. If anchor bolts are shown, then cast-in anchor bolts shall be used.
 - 2. If epoxy-set anchors are shown, the Contractor may use cast-in anchor bolts or epoxy-set anchors.

1.04 SUBMITTALS

- A. Provide submittals in compliance with Section 01330 – Submittal Procedures.
- B. Shop Drawings and Product Data:
 - 1. Sufficient to verify compliance with specifications, to include manufacturer's literature on sizes, material and installation procedures.

1.05 QUALITY ASSURANCE

- A. Compliance with the requirements specified herein may necessitate modification to the manufacturer's standard materials or equipment.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver anchor bolts and templates in time to permit setting when structural concrete is placed.

PROJECT/SITE CONDITIONS

- B. Environmental requirements: See Specification Section 02000

PART 2- PRODUCTS

2.01 MATERIALS

- A. General:
 - 1. Generally all fasteners in or near the process flow, in tanks, etc. shall be stainless steel.
- B. Bolts:
 - 1. Carbon steel: ASTM A307.
 - 2. Stainless steel: ASTM 276, Grade 303, 304, 305 or 316.
 - 3. Galvanized steel: Carbon steel, hot-dip galvanized, ASTM A153; or zinc plated, ASTM A164 type GS.
- C. Nuts:
 - 1. Same material as bolts.
 - 2. Carbon steel: ASTM A307, Grade B heavy hexagonal.
 - 3. Stainless Steel: ASTM 276, Grade B heavy hexagonal.
 - 4. Self-locking: Prevailing torque, IFI-100, grade A.
 - 5. Use anti-seize compound on stainless steel threads.
- D. Washers:
 - 1. Same material as bolts.
 - 2. Flat: ANSI B27.2.
 - 3. Locking: Spring type ANSI B27.1.
- E. Epoxy set anchors:
 - 1. In hardened concrete and fully grouted masonry:
 - a. Parabond capsule anchors.
 - b. Ceramic 6 epoxy threaded rod anchors.
 - c. Stainless steel studs, nuts and washers.
 - d. Approved manufacturers:
 - 1) Hilti HIT RE500 were used in Design. Or equal submittals shall have the same or greater properties.
 - 2) Or equal.

2.02 FABRICATION

- A. Anchor bolts:
 - 1. 3/4-inch minimum, except as indicated on the Drawings.
 - 2. Type:
 - a. General use: L-shaped hook type.
 - b. Where indicated on Drawings or specified:

- 1) Straight bolt with square head.
 - 2) Straight bolt with square plate welded to bolt and nut welded to plate and bolt.
 - 3) Through-bolt with sleeve and square plate assembly.
 - 4) Coupled bolt with sleeve welded to square plate and bolt.
- B. Epoxy set anchors:
1. 3/4-inch minimum.
 2. Where indicated on Drawings.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify that holes for anchor bolts in forms and templates match applicable equipment Shop Drawings or templates.

3.02 INSTALLATION

- A. Anchor bolts:
1. Where installed in cast-in-place concrete, install a nut on the concrete side of the form or supporting template.
 2. Provide three (3) nuts for each anchor bolt for which a lock nut is indicated, two (2) for others.
 3. Sleeved anchor bolts:
 - a. Centered in pipe sleeve.
 - b. Sleeve ID: Approximately 2-1/2 times bolt OD.
 - c. Sleeve length: Approximately eight (8) times bolt OD.
 - d. Bearing plate minimum thickness: 1/2 times bolt OD.
 4. Through bolts:
 - a. Sleeved with bearing plates.
 - b. Bearing plates welded to bolt and plate welded to sleeve.
 - c. Dimensions: As specified for sleeved anchor bolts.
- B. Epoxy set anchors:
1. Install as per manufacturer's recommendation.
 2. Clean hole and inspect prior to installation.
 3. Minimum hole depth: As per manufacturer's recommendation but not less than 6-5/8 inches.
 4. Diameter of drilled holes: As per ANSI B94.12.

3.03 SCHEDULES

- A. Anchorage materials to be as noted on plans.
- B. If materials are not noted on plans, the materials shall be:
1. Submerged: 316 stainless steel.
 2. Encased in concrete: Carbon steel.
 3. Exposed outdoors: Galvanized

END OF SECTION

SECTION 05999

MISCELLANEOUS METAL

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Items fabricated from metal shapes, plates, sheets, rods, bars or castings.
2. Structural steel.

B. Related sections:

1. Related Work specified elsewhere:
 - a. Grout: Section 03600
 - b. Anchor Bolts and Expansion Anchors: Section 05501

1.02 REFERENCES

A. Reference standards:

1. AISC "Steel Construction Manual."
2. AISC "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings."
3. ASTM A1: Carbon Steel Tee Rails.
4. ASTM A36: Structural Steel.
5. ASTM A366: Steel, Carbon, Cold-Rolled Sheet, Commercial Quality.
6. ASTM A569: Steel, Carbon (0.15 Max, Percent), Hot-Rolled Sheet and Strip, Commercial Quality.
7. ASTM A325: High Strength Bolts for Structural Joints.
8. ASTM A307: Carbon Steel Externally Threaded Standard Fasteners
9. ASTM A490: Quenched and Tempered Alloy Steel Bolts for Structural Steel Joints.
10. FS WW-F-461: Floor Plate, Steel, Rolled.
11. ASTM A500: Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
12. ASTM A501: Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
13. ASTM 48: Gray Iron Castings.
14. ASTM A167: Stainless and Heat Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
15. ASTM B36: Brass Plate, Strip and Rolled Bar.
16. ASTM B61: Steamor Valve Bronze Castings.
17. ASTM B140: Copper-Zinc-Lead (leaded Red Brass or Hardware Bronze) Rod, Bar, and Shape.
18. ASTM B97: Copper-Silicon-Alloy Plate, Strip and Rolled Bar for General Purposes.
19. ANSI A202.1: Metal Bar Grating Manual for Steel and Aluminum Gratings and Stair Treads.

20. ASTM A120: Pipe, Steel, Black and Hot-Dipped, Zinc Coated (Galvanized) Welded and Seamless for Ordinary Uses.
21. AWS D1.1: Structural Welding Code, American Welding Society.

1.03 SUBMITTALS

- A. Product Data and Shop Drawings:
 1. Product Data describing each manufactured metal specialty.
 2. Shop Drawings describing each fabricated item.
 3. Erection Drawings for structural steel.

1.04 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies: Guardrail, steps and ladders shall comply with all applicable provisions of OSHA.
- B. Compliance with the requirements specified herein may necessitate modification to the manufacturer's standard materials or equipment.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Store on blocking so that no metal touches the ground and water cannot collect thereon.
- B. Protected from bending under its own weight or superimposed loads.

1.06 PROJECT/SITE CONDITIONS

- A. Environmental requirements: See Specification Section 02000.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Steel:
 1. Plates and shapes: ASTM A36, Fy-50 Ksi.
 2. Sheets: ASTM A366 or A569, zinc coated.
 3. Pipe: ASTM A120.
 4. Bolts:
 - a. High strength: ASTM A325.
 - b. Unfinished: ASTM A307.
 - c. Self-locking nuts: Prevailing torque type; IFI-100, Grade A.
 - d. Flat washers: ANSI B27.2.
 - e. Lock washers: Spring type, ANSI B27.1.
 - f. Beveled washers: Table 1 of Specifications for Structural Joints Using ASTM A325 or A490 Bolts, AISC Steel Construction Manual.
 5. Welds:
 - a. Specifications and Codes, AISC Steel Construction Manual.

- b. AWS D1.1 American Welding Society.
 - c. Welding Electrodes: AWS 5.20 E70TX.
- 6. Structural tubing: ASTM A500 or A501.
- B. Cast iron: ASTM A48, Class 25 or better.
- C. Stainless steel: 316.
 - 1. Plates: ASTM A167.
 - 2. Bolts: IFI-104, Grade 303 or 305.
- D. Aluminum:
 - 1. Sheet and plate: ASTM B209, alloy 6061-T6.
 - 2. Rolled sections: ASTM B308, alloy 6061-T6.
 - 3. Rod and bar: ASTM B211, alloy 6061-T6 or 2017-T4.
 - 4. Extrusions: ASTM B221, alloy 6063-T5 or T6.
 - 5. Pipe: ASTM B429, alloy 6061-T6 or 6063-T6.
 - 6. Rivets: ASTM B316, alloy 6061-T6.
 - 7. Bolts: IFI-104, Grade 24T4.
 - 8. Castings: ASTM B26 or B85.
- E. Shop coatings:
 - 1. Provide shop coatings:
 - a. Rust inhibitive shop primer for steel.
 - b. Zinc rich primer.
 - c. Coal tar paint.
 - 2. Galvanizing:
 - a. Hot-dip process: ASTM A123, A133, A385.
 - b. No passivator is to be used on any surface to be painted. If a passivator is found to be present, abrasive blasting will be required to remove it or replacement of the member.
 - 3. Bolt galvanizing:
 - a. Zinc: ASTM A164, Type GS.
 - b. Cadmium: ASTM A165, Type NS.
 - 4. Aluminum.
 - a. Standard mill finish.
 - b. Clear anodize.

2.03 FABRICATION

- A. General:
 - 1. In accordance with dimensions, arrangement, sizes and weights or thicknesses indicated on drawings or specified.
 - 2. All members free of winds, warps, local deformations or unauthorized bends.
 - 3. Holes and other provisions for field connection accurate and shop checked for proper fit.
 - 4. Mark each piece according to the erection Drawing.
 - 5. Provide all field connection materials.

B. Connections:

1. General:
 - a. As indicated on the Drawings.
 - b. Welds:
 - 1) Specifications and Codes AISC Steel Construction Manual.
 - 2) AWS D1.1, Structural Welding Code.
 - c. Where welding is permitted or required:
 - 1) Butt, miter, and fillet welds continuous.
 - 2) Exposed welds ground smooth.
 - 3) Intermittent welds:
 - a) Two (2) inch minimum effective length.
 - b) Six (6) inch maximum spacing.
2. Structural:
 - a. If not indicated on the Drawings, as defined in "Connections" of the AISC Manual latest edition.
 - b. Shop connections may be bolted, welded or riveted.
3. All others: If not indicated on the Drawings, unfinished bolts with self-locking nuts or lock washers.

C. Shop coating:

1. Preparation:
 - a. All surfaces to be at the proper temperature, dry and free of grease, oil, dirt, dust, grit, rust, loose mill scale, weld flux, slag, weld spatter and other objectionable substances.
 - b. Scrape, chip and brush welds as required to remove all spatter.
 - c. Dull sharp corners of cut or sheared edges with at least one pass of a power grinder.
2. Galvanizing: Hot-dipped galvanizing after fabrication.
3. Castings: Hot dip in asphalt varnish or coat with coal tar paint, 6 mils minimum.
4. Steel:
 - a. Unless otherwise indicated or specified, coat with rust inhibitive primer, 1-1/2 mils minimum.
 - b. Apply after fabrication.
 - c. Coat as soon after cleaning as practicable.
 - d. Apply in a heated structure if outside air temp is below 50 degrees F.
 - e. Do not move or handle until coating is dry and hard.
5. Aluminum: Coat all surfaces to come in contact with concrete, cement, mortar, or dissimilar metals with coal tar paint, 6 mils minimum.
6. Other surfaces: Do not shop coat galvanized steel, stainless steel or bronze.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Before assembly, thoroughly clean all parts that will be in contact with each other.

3.02 INSTALLATION

A. General:

1. Assemble all parts accurately as indicated on the Drawings or measured in the field.
2. Set baseplates level and grout in place.

B. Connections:

1. General.
 - a. As indicated on the Drawings.
 - b. Where welding is permitted or required.
 - 1) Butt, miter and fillet welds continuous.
 - 2) Exposed welds ground smooth.
 - 3) Intermittent welds.
 - a) Minimum effective length: 2 inches.
 - b) Maximum spacing: 6 inches.
 - c. Light drifting is permitted to draw parts together.
 - d. No drifting to match unfair holes.
 - e. Enlarge holes, if necessary, by reaming with twist drills.
 - f. No burning to enlarge holes.
2. Structural steel.
 - a. High strength bolts.
 - 1) Turn-of-nut tightening as described in "Specifications for Structural Joints Using ASTM A325 or A490 Bolts" in the AISC manual.
 - 2) Use beveled washers when the bearing faces of bolted parts have a slope of 1:20 or greater with respect to a plane perpendicular to the bolt axis.
 - b. No field welding of structural steel, except as indicated on the drawings.
 - c. Tolerances:
 - 1) All members level, plumb and aligned within 1:500.
 - 2) Top elevation of members within 1/16-inch of that indicated on Drawings.

3.03 FIELD QUALITY CONTROL

A. Structural steel connections:

1. Provide a platform or other means of access for inspection of each field connection.
2. Leave in place until inspected by Engineer.

END OF SECTION

SECTION 09900

PAINTING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

Field painting, including surface preparation, finish coats, priming, piping identification, protection of surfaces and related work.

1. Surfaces shall have at least three (3) coats of paint at conclusion of field painting, unless otherwise specified.
2. Apply at least two (2) field coats of paint to all surfaces, regardless of number of paint coats previously applied unless specifically noted otherwise.
3. Paint all new construction, pipe, hangers, doors, etc.
4. Paint existing construction and equipment as specifically mentioned, and any area damaged by construction.
5. Painting shall include painting of all galvanized surfaces.

B. Related sections:

1. Related Work specified elsewhere:
 - a. Miscellaneous Metal: Section 05999
 - b. Sealants and Caulking: Section 07900
 - c. Metal Doors and Frames: Section 08100

1.02 SUBMITTALS

A. Product Data:

1. Furnish complete manufacturers product data, certificates, test data:
 - a. Label each paint submittal with paint type and intended use.
2. Colors samples:
 - a. Furnish color chips for color selection by Owner.
 - b. Owner will prepare color schedule after submittals. Provide colors in accordance with Schedule. Selections by Owner may exceed manufacturers standard range of colors.

1.03 QUALITY ASSURANCE

A. Field samples:

1. Sampling of material:
 - a. Provide test samples at random from sealed containers stored on site.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Packing and shipping:

1. Deliver paint to the job site in original unopened containers with labels intact, and include:
 - a. Manufacturers name.
 - b. Type of paint.
 - c. Manufacturers stock number.
 - d. Color.
 - e. Instructions for reducing, where applicable.
2. Storage and protection:
 - a. Store only acceptable project materials on project site.
 - b. Store in a suitable location inside and protect from freezing.
 - c. Restrict storage to paint materials and related equipment.
 - d. Comply with health and fire regulations.
 - e. Remove immediately any materials delivered open or subject to improper storage.

1.05 PROJECT/SITE CONDITIONS

A. Environmental requirements: See specification section 02000

B. Paint application requirements:

1. Do not apply paint when:
 - a. Air temperature is below 50 degrees F.
 - b. Surfaces of metals, such as surfaces of a pipe containing cold water, have a temperature below 50 degrees F.
 - c. Metal temperature and atmospheric conditions cause condensation on surface of metal.
2. Comply with manufacturers recommendations as to environmental conditions under which coatings and coating systems can be applied.
3. Do not apply finish in areas where dust is being generated.
4. Apply paint when air and surface temperature are within those recommended by manufacturer for coating being applied.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable manufacturers:

1. The names of acceptable manufacturers are included in Article 2.02, Materials, describing the various types of coatings.
2. Compliance with the requirements specified herein may necessitate modification to the manufacturers standard material or equipment.

2.02 MATERIALS

A. Primers and pretreatments:

1. High build epoxy primer:
 - a. Tnemec, Series 69.
 - b. Ameron, Amerlock 400.
 - c. Futura, Futura-Bond 306.
 - d. Devoe, Bar Rust 235.
 - e. Carboline Carboguard 890.
2. 100 percent solids epoxy primer:
 - a. Tnemec Series 201 epoxoprime.
 - b. Degussa ThoRoc Nitoprime 60.
 - c. Carboline Carboguard 1340.
3. Self-cross linking hydrophobic acrylic:
 - a. Tnemec Series 115.
4. Etching primer:
 - a. Galva Prep 5.
5. Coal Tar Epoxy:
 - a. Carboline 300M.
 - b. Tnemec Series 46-465 H.B. Tnemecol.

B. Intermediate and finish coats:

1. High build epoxy:
 - a. Tnemec Series 69.
 - b. Ameron, Amerlock 400.
 - c. Devoe, Bar Rust 235.
 - d. Futura, Ultra-Line 372.
 - e. Carboguard 890.
2. 100% Solids epoxy:
 - a. Tnemec 434.
 - b. Degussa SewerGuard HBS100.
 - c. Sauereisen SewerGuard 210S.
 - e. Carboline Plasite 4500/4500S.
3. High build aliphatic polyurethane:
 - a. Tnemec, Series 1075 Endura-shield.
 - b. Ameron, Amercoat 450 HS.
 - c. Devoe, Devthane 369.
 - d. Futura, Futura-Thane 656.
 - e. Carboline Carbothane 134VOC.
4. Acrylic:
 - a. Tnemec Series 1029.
 - b. Devoe, Devflex 602.
 - c. Carboline Carbocrylic 3359.
5. Coal Tar Epoxy
 - a. Carboline 300M
 - b. Tnemec Series 46-465 H.B. Tnemecol.

2.03 SOURCE QUALITY CONTROL

A. Verification of performance:

1. Use product of single manufacturer for coating systems for each type of surface.
2. Use paint compatible with shop coating or primer for field coating of shop painted or primed surfaces, including verification of compatibility of paints used for Owner furnished equipment.
3. Use only mercury-free, fumeproof paint for intermediate and finish coats. Paint must be suitable for atmosphere containing hydrogen sulfide.
4. Use only lead-free paint.
5. Use paint that does not discolor in sewage plant atmosphere.
6. Use only chromate-free primers.
7. Provide tie coats where recommended by manufacturer.
8. Consistency and viscosity:
 - a. Factory mix paint to proper consistency and viscosity for hot weather application without thinning.
 - b. Thin paint only as necessary to obtain recommended coverage at lower application temperatures.
 - c. Do not reduce wet film thickness of applied paint by addition of paint thinner, or for any other reason, below that represented by the recommended coverage rate.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protection:

1. Use drop cloths, masking tape, or other effective methods to protect surfaces from spraying, spattering, or spilling of paint.
2. Remove paint deposited on surfaces which are not being painted at that time.
3. Exposed concrete or masonry not specified to be painted which is damaged by paint shall be:
 - a. Removed and rebuilt, or
 - b. Painted in entirety with two (2) coats of paint as directed by Owner.
4. Repair all damage caused by painting to other items of work.
5. Surface clean bituminous paints spilled or dropped and spot paint with aluminum paint prior to specified paint.
6. Paint used in successive field coats shall be by same manufacturer.
7. Field coats shall not damage shop applied undercoats.

B. Surface preparation:

1. General surfaces:
 - a. Surfaces to be painted shall:
 - 1) Be dry, free of dirt, dust, sand, grit, mud, oil, grease, rust, loose mill scale, or other objectionable substances.
 - 2) Meet recommendations of paint manufacturer for surface preparation.

- 3) Be freed of oil and grease by use of solvents or detergents before mechanical cleaning is started.
- 4) Be free of cracks, pits, projections, or other imperfections which would prevent formation of a smooth, unbroken paint film.
- 5) Perform cleaning and painting operations in a manner which will prevent dust or other contaminants from settling on freshly painted surfaces.
- 6) Remove gloss and dull the surface of previously painted surfaces for proper adhesion of top coats.
- b. Touch-up paint and repair of previously painted surfaces.
 - 1) Clean, sand, or wire brush such surfaces in a manner that edges of adjacent paint are feathered or otherwise smoothed.
 - 2) Touch-up and repair of painted surfaces shall not be noticeable when completed.
 - 3) Completely remove paint made brittle or otherwise damaged by heat of welding and repair as stated above.
2. Specific surfaces:
 - a. Ferrous metal surfaces: Unless otherwise indicated, per Steel Structures Painting Manual, Vol. 2, "Systems and Specifications."
 - 1) Steel; structural, tanks, pipe, and equipment:
 - a) Non-submerged: SSPC-SP-6.
 - b) Submerged or partially submerged: SSPC-SP-10.
 - c) High temperature surfaces to 1200 degrees F: SSPC-SP-10.
 - 2) Not used
 - 3) Galvanized steel:
 - a) Interior, non-submerged: Spot SSPC-SP3, full SSPC SP-1.
 - b) Exterior or submerged: SSPC-SP7 to clean and scarify to obtain a uniform angular profile between 1.0 and 2.0 mil.
 - b. Concrete, masonry, and cement plaster:
 - 1) Remove all dirt, dust, stains, grease, before painting.
 - 2) Fill cracks and irregularities with concrete block filler to provide uniform surface texture.
 - 3) Acid etch floors per ASTM 4260 using type and percentage of acid recommended by floor coating manufacturer.
 - 4) Fill concrete masonry unit surfaces with concrete block filler, except interior surfaces to be painted with latex which do not need to be filled and all surfaces to receive a block sealer.
 - 5) Seal exterior concrete masonry unit surfaces with block sealer.
 - 6) Do not paint until moisture content falls below 3 percent. Check moisture content per ASTM F2170-02. Do not paint when relative humidity exceeds 75 percent.
 - 7) Cure 28 days minimum prior to coating.
 - 8) All concrete surfaces to be coated that are subject to immersion, splash, spillage or heavy concentration of corrosive fumes shall be cleaned in compliance with NACE No. 6/SSPC-SP13. These surfaces shall be abrasive blasted per ASTM D4259 or SSPC-SP12/NACE5. Obtain a surface profile of ICRI CSP5.
 - c. Aluminum:
 - 1) Clean all surfaces, per ASTM 01730-09. Achieve a uniform profile of 1.0 to 1.7 mil.
 - d. Copper:

- 1) Buff or polish to bright color.
 - 2) Remove flux residue from joints in copper tubing.
 - 3) Clean surface with mild phosphoric acid cleaner.
 - 4) Apply finish while surface is clean and bright.
- e. PVC plastic:
 - 1) Remove all wax and oil with solvent in accordance with recommendations of primer manufacturer.
 - 2) Scarify.
- f. Hardware: Remove any visible dirt, corrosion, or foreign material.
3. Abrasive blasting procedures:
 - a. Per Cal-OSHA requirements.
 - b. Per California Air Resources Board requirements.
 - c. Do not allow surfaces to become wet after blasting and before painting.
 - d. Apply primer same day as blasting.
 - e. Depth of abrasive blasted surface: Not less than 1 mil or greater than 2 mils unless recommended otherwise in writing per the coating manufacturer.
 - f. Air free of water and oil.
 - g. Confine abrasive blast media to area being prepared.
 - h. Protect nameplates, valve stems, rotating equipment, motors, and other damageable items.
 - i. Do not reuse abrasive.
 - j. Plug pipe, holes, or openings before abrasive blasting. Keep covered until abrasive is removed.
4. Mixing and tinting:
 - a. Deliver paints and enamels ready-mixed to job site.
 - b. Mix only in mixing pails, suitable sized, non-ferrous or oxide metal pans.
 - c. Use tinting colors recommended by manufacturer for specific type of finish.
 - d. Do not add any adulterants or unauthorized thinners.
 - e. Thoroughly mix each time paint withdrawn from container.
 - f. Keep containers closed tightly except while paint is withdrawn.
 - g. All paint factory mixed.
 - h. Thinning only permitted to obtain recommended coverage at lower application temperatures.
 - i. Do not thin paint below recommended coverage rate.

3.03 APPLICATION

A. General requirements:

1. Do not apply initial coating until moisture content of surface is within moisture limitations of paint manufacturer.
2. Apply paint with suitable brushes, rollers, or spraying equipment.
 - a. Rate of application shall not exceed that as recommended by paint manufacturer for the surface involved.
 - b. Keep brushes, rollers, and spraying equipment clean, dry, free from contaminants and suitable for the finish required.
3. Comply with recommendation of product manufacturer for drying time between succeeding coats.
4. Vary slightly the color of successive coats.
5. Sand and dust between each coat to remove defects visible from a distance of 5 feet.

6. Finish coats shall be smooth, free of brush marks, streaks, laps or pile up of paints, and skipped or missed areas.
7. Inspection:
 - a. Do not apply additional coats until completed coat has been inspected by the Owner.
 - b. Only inspected coats of paint will be considered in determining number of coats applied.
8. Make edges of paint adjoining other materials or colors clean and sharp with no overlapping.
9. Leave all parts of moldings and ornaments clean and true to details with no undue amount of paint in corners or depressions.
10. Apply primer on all Work before glazing.
11. Refinish whole wall where portion of finish has been damaged or is not acceptable.
12. Surfaces to be painted with water-thinned paint: Spot prime exposed nails and other ferrous metals with aluminum paint.
13. Application temperatures:
 - a. Ambient, substrate and material temperatures must be within manufacturers minimum and maximum range per product data sheet.
14. Relative humidity: 85 percent maximum.
15. Apply paint in a neat manner with finished surfaces free of runs, sags, ridges, laps, and brush marks.
16. Do not apply successive coats until each previous paint coat is hard and dry through entire paint film:
 - a. Apply each coat in a manner that will produce an even film of uniform and proper thickness.
 - b. Do not apply any coat at a rate of coverage per gallon which is greater than maximum rate recommended by manufacturer.
 - c. Avoid paint films showing sags, checks, blisters, teardrops, or fat edges:
 - 1) Remove paint containing such defects and repaint.
17. Priming:
 - a. Provide a brush coat of primer to edges, corners, crevices, welds, bolts, and nuts before specified spot or touch-up painting of metal surfaces.
 - b. Give special attention to filling crevices.
 - c. Cover prime coats with a tie coat if recommended by manufacturer of finish coating.
18. Repaint abraded and otherwise damaged portions of shop applied paint.
19. Welded seams and other uncoated surfaces:
 - a. Use specified primer on:
 - 1) Welded seams and other uncoated surfaces.
 - 2) Field installed bolts, nuts, and washers.
 - 3) Surfaces where paint has been damaged by heat.
 - b. Do not apply finish coats to patch, spot, or touch-up painting until such painting is dry and hard.

B. Rate of application:

1. Coverage not greater than value recommended by manufacturer.
2. Do not use paint thinner as means of extending coverage of paint.

C. Special, paint the following items:

<u>Item</u>	<u>Color</u>
1. Areas where hand injury is possible	Orange
2. Fire extinguishers and emergency shut off buttons	Red
3. Machinery, power boxes, motors and motor platforms	Gray
4. Trip hazards	Yellow
5. Barrier posts	Yellow
6. Miscellaneous metal	Gray

3.04 FIELD QUALITY CONTROL

A. Mixing and thinning:

1. Thoroughly mix paint each time any is withdrawn from container.
2. Keep paint containers tightly closed except when withdrawing paint.
3. Thin only as necessary to obtain recommended coverage at lower application temperatures.
4. Wet film thickness of applied paint shall not be reduced:
 - a. By addition of paint thinner or otherwise.
 - b. Below that represented by the recommended coverage rate.

3.05 CLEANING

- A. Touch up and restore finish where damaged.
- B. Remove spilled, splashed, or splattered paint from all surfaces.
- C. Do not mar surface finish of item being cleaned.
- D. Leave storage space clean and in condition required for equivalent spaces in project.

3.06 SCHEDULES

- A. All new construction plus existing construction specifically listed or damaged by construction.
- B. Coating systems:
 1. Epoxy:
 - a. Primer: High build epoxy primer: 4.0-6.0 DFT mils.
 - b. Intermediate: High build epoxy: 4.0-6.0 DFT mils.
 - c. Finish: High build epoxy: 4.0-6.0 DFT mils.
 - d. Total dry film thickness (DFT): 12.0-18.0 mils.
 2. 100% solids epoxy:
 - a. Primer: 100% solids epoxy primer: 4.0 to 8.0 mils..
 - b. Finish: 100% solids epoxy: 65 to 80 mils.
 3. Urethane:
 - a. Primer: High build epoxy primer: 4.0-6.0 DFT mils.
 - b. Intermediate: High build epoxy: 4.0-6.0 DFT mils.
 - c. Finish: High build aliphatic polyurethane: 2.0-3.0 DFT mils.

- d. Total dry film thickness (DFT): 10.0-15.0 mils.
- 4. Acrylic:
 - a. Primer: PVA sealer: 1.0-2.0 DFT mils.
 - b. Intermediate: Acrylic: 2.0-3.0 DFT mils.
 - c. Finish: Acrylic: 2.0-3.0 DFT mils.
 - d. Total dry film thickness (DFT): 5.0-8.0 mils.
- 5. Galvanized steel coating:
 - a. Pre-treatment: Galva Prep 5.
 - b. Primer: Tnemec 115 - 2.5 to 3.5 mil.
 - c. Finish: Tnemec 1029
- 6. Coal Tar Epoxy:
 - a. Apply per manufacturer's recommendation.

C. General coating schedule:

<u>Area</u>	<u>System</u>
1. Exterior exposed piping and ferrous metal:	Urethane
2. Interior exposed piping and ferrous metal:	Epoxy
3. PVC piping - interior:	Epoxy
4. PVC piping - exterior:	Urethane
5. Aluminum in contact with concrete or dissimilar metals:	Epoxy
6. Other areas as noted on Drawings	

D. Surfaces not to be painted:

- 1. Except as otherwise required or directed, do not paint the following surfaces:
 - a. Polished or finished stainless steel. Unfinished stainless steel shall be painted, including stainless steel air piping.
 - b. Flexible rubber and plastics.
 - c. Concrete floors
 - d. Finished aluminum products.
 - e. Aluminum grating and checkered plate.

END OF SECTION

SECTION 11310
SEWAGE LIFT STATIONS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
1. Furnish and install two (2) complete, dual pump, factory built and tested lift station for constant speed submersible pumps on rail systems for pumping raw sewage. This includes, but is not limited to: pumps, rails, lids, wetwells, controls, sensors, and all other components required to construct a complete and functional sewage lift station.
- B. Related sections:
1. Related Work specified elsewhere:
 - a. Grout: Section 03600
 - b. Anchor Bolts and Expansion Anchors: Section 05501
 - c. Painting: Section 09900
 - d. Pipe and Pipe Fittings: Section 15060

1.02 REFERENCES

- A. Equipment shall comply with the applicable portions of the latest editions and amendments of the following:
1. Hydraulic Institute Standards (HIS).
 2. American Society of Mechanical Engineers (ASME).
 3. National Electrical Code (including NFPA 70).
 4. Institute of Electrical and Electronic Engineers (IEEE).
 5. National Electrical Manufacturers Association (NEMA).
 6. American National Standards Institute (ANSI).
 7. Anti-Friction Bearing Manufacturers Association (AFBMA).
 8. American Society for Testing and Materials (ASTM).

1.03 SYSTEM DESCRIPTION

- A. Giovanni Lift Station: Submersible pumps shall be designed for continuous duty under the following operating conditions:
1. No. of pumps 3
One duty, one standby and one spare, not installed
 2. Rated design point:

Flow, gpm	200
Head, feet	120
 3. Maximum pump speed rpm 1,800

4.	Approximate Pump Horsepower	17
5.	Pump motor driver	Constant

B. **(Bid Alternate Item)** Madrone Lift Station: Submersible pumps shall be designed for continuous duty under the following operating conditions:

1.	No. of pumps	3
	One duty, one standby and one spare, not installed	
2.	Rated design point:	
	Flow, gpm	100
	Head, feet	85
3.	Maximum pump speed rpm	1,800
4.	Approximate Pump Horsepower	10
5.	Pump motor driver	Constant

C. Design coordination:

1. Pump manufacturer to furnish and coordinate wetwell, driver, lifting rails and devices, and all other pump components and to provide written installation and checkout procedures to provide a fully operational system to meet the specified performance.

D. Lift Stations shall comply with NFPA 820, Standard for Fire Protection in Wastewater Treatment and Collection Facilities.

1.04 SUBMITTALS

A. Shop Drawings and Product Data:

1. Submit complete Shop Drawings and Product Data.
2. Submit Operation and Maintenance Manual.
3. Submit the following information:
 - a. Pumps:
 - 1) Name of manufacturer.
 - 2) Type and model.
 - 3) Rotational speed.
 - 4) Suction/discharge sizes.
 - 5) Rotated capacity.
 - 6) Total dynamic head at rated capacity.
 - 7) Maximum pump speed at rated capacity.
 - 8) Maximum brake horsepower at rated capacity.
 - 9) Net weight/configuration of complete assembly including motor.
 - 10) Materials of construction.
 - 11) Calculations demonstrating safety factor of lifting devices, e.g., wire rope, clevis devices.
 - b. Motors:
 - 1) Name of manufacturer.
 - 2) Type/model.
 - 3) Motor design and performance data.

B. Quality control submittal:

1. Test reports:
 - a. Submit certified copies of shop test reports at least ten (10) days before shipping the equipment.
 - b. Reports shall include:
 - 1) Test log.
 - 2) Description of test piping, equipment, flow measurement device, and setup.
 - 3) Test procedure.
 - 4) Certified performance curves, plotted against capacity.
 - a) Head.
 - b) Brake horsepower.
 - c) Efficiency.
 - d) Actual speed.
 - e) Net positive suction head available.
 - 5) Plot curve to be easily read at scales consistent with the performance requirements.

C. Operation and Maintenance Manuals:

1. Pump: Supply Operation and Maintenance Manual, Shop Drawings, Samples.
2. Motors:
 - a. Furnish complete Operations and Maintenance Manual.
 - b. List lubricants and recommended lubrication schedule and procedures.
 - c. Connection diagrams.
 - d. Bearings types and catalog numbers.
 - e. Representative certified motor performance curves and operating point data.

1.05 QUALITY ASSURANCE

- A. The supplier shall be regularly engaged in the business of designing and manufacturing centrifugal pumps for a period of excess of ten (10) years.
- B. All equipment to be supplied by single manufacturer.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Preparation for shipment:
 1. Package materials and equipment to facilitate handling and protect against damage during transit, handling or storage.
 2. Box, crate, or otherwise completely enclose and protect all equipment.
 3. Protect equipment from exposure to the elements and keep thoroughly dry and dust-free at all times.
 4. Protect painted surfaces against impact, abrasion discoloration or other damage.
 5. Grease or oil all bearings and similar items.
 6. Tag or mark each item per the delivery schedule or the Shop Drawings.
 7. Include complete packing lists and bills of material with each shipment.
- B. Exercise care in shipping and handling to prevent damage to equipment in accordance with the manufacturer's instructions.

1.07 PROJECT/SITE CONDITIONS

- A. Environmental requirements: See specification section 02000

1.08 WARRANTY

- A. Submit Warranty documentation

1.09 MAINTENANCE

- A. Tools and spare parts:
 - 1. Provide a set of all tools required for complete assembly and disassembly of pump components.
 - 2. Provide recommended spare parts packed and labeled for storage.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable manufacturers:
 - 1. Flygt
 - 2. Or approved equal. "Or equal" pumps must be submitted and approved prior to bidding.

2.02 MATERIALS

- A. Pump material:
 - 1. Frame: Cast iron, ASTM A48.
 - 2. Casing: Cast iron, ASTM A48.
 - 3. Impeller: Cast iron, ASTM A48.
 - 4. Shaft: High grade stainless steel, ASTM 1045 or ASTM A276 Type 430 F.
 - 5. Bearings: Anti-friction.
 - 6. Base: Cast iron, ASTM A48.
 - 7. Mechanical Seals: Tungsten-carbide ring or silicone carbide.
- B. Slide rail assembly materials:
 - 1. Base and discharge elbow: Cast iron, epoxy coated, ASTM A48.
 - 2. Rails: 316 stainless steel.
 - 3. Anchor bolts: 316 stainless steel.
 - 4. Lifting cable: 316 stainless steel.
 - 5. Upper and intermediate guide brackets: 316 stainless steel.

2.03 MANUFACTURED UNITS

A. General:

1. Pumps shall be mounted in vertical shaft position.
2. Provide a complete rail system for easy removal of each pump from wet well.
3. Each pump with lifting eye bolts or lugs designed with safety factor of 10.
4. Quick disconnect pipe connection fitting for pumps.
5. Provide 316 stainless steel lifting wire rope for each pump with safety factor of 10.
6. Provide extra, loose, 316 stainless steel nameplate for each pump and motor to be field-mounted on junction box.
7. Provide Mix/Flush valves on each pump. Flygt 4901 or equal.

B. Impeller:

1. One (1) piece cast iron, epoxy coated machined completely on exterior surfaces and dynamically balanced at maximum speed.
2. Non-clog.
3. Pass minimum 3-inch solids.
4. Key and lock to shaft with self-locking type fastener.
5. Interior water passages shall have uniform sections, smooth surfaces and be free from cracks and porosity.
6. Lock securely to shaft so it will not be loosened by reverse rotation.
7. Readily removable.

C. Seals:

1. Each pump shall be provided with mechanical shaft seals per the manufactures standard.

D. Bearings:

1. AFBMA L-10 or B-10 rating of 100,000 hours at specified operating conditions.
2. Shaft speed shall not exceed bearing manufacturer's limitations.

E. Balance:

1. Machine accurately rotating parts and place these parts in as nearly perfect rotational balance as practicable.
2. Excessive vibration shall be sufficient cause for rejection of equipment.
3. Distribute mass of the unit such that resonance at normal operating speeds is avoided.
4. Vibration displacement (peak-to-peak) as measured at all points on the machine shall not exceed 6.0 mils, and that of the shaft measured at face of stuffing box shall not exceed 2.0 mils.
5. Ratio of rotative speed to critical speed of all units or components shall be less than 0.8 or more than 1.3 at any operating speed.

F. Guide rail assembly:

1. Submersible pumps:
 - a. Seal:

- 1) Provide manufactures standard for sewage service
- b. Base and discharge elbow:
 - 1) Elbow discharge size:
 - a) To match pump.
- c. Guide rails:
 - 1) Schedule 40, 316 stainless steel pipe, with a minimum of 2-inch diameter.
 - 2) Provide upper, intermediate, and lower supports. Spacing to be less than four (4) feet between supports.
- d. Lifting cable:
 - 1) High tensile strength stainless steel chain.
 - 2) Minimum cross section area: Meet safety factor of 10.0.
- e. Assembly bolts and anchor bolts:
 - 1) 316 stainless steel assembly bolts and anchor bolts, nuts, and washers.
 - 2) Epoxy set anchor bolts with pipe sleeves are required.
 - 3) Provide template and anchor bolts.

2.04 COMPONENTS

A. Pump construction:

1. Submersible sump pump with motor and pump unit as one self-contained unit.
2. Provide power cable suitable for domestic sewage and sludge with oil, grease and fat content.
3. Pump shall be constructed so pump components can be disassembled and reassembled without disturbing the integrity of the sealed motor.

2.05 FABRICATION

A. Shop assembly:

1. Fully assembled at manufacturer's shop and ready for power and piping connection.
2. Ship lubricant in separate sealed container.

B. Factory/shop finishing:

1. Factory finish as required for submerged sewage service.

2.06 SOURCE QUALITY CONTROL

A. Source quality control:

1. Factory test each pump for capacity, power requirements, efficiency at specified rated head, shutoff head, operating head extremes, and as many other points as necessary of accurate performance curve plotting.
2. Test each pump/motor assembly as being shipped to the field.
3. Provide certified test results.
4. Perform tests and prepare test reports in accordance with Hydraulic Institute Standards.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. A General Contractor will install the equipment under the guidance of the Equipment Manufacturer.
- B. Detailed instructions and field assistance to be provided by the Supplier.

3.02 FIELD QUALITY CONTROL

- A. Service:
 - 1. Prequalified service personnel must be available on a 24-hour-a-day basis.
 - 2. The personnel must be completely familiar with the items supplied so as to return the equipment to service in the shortest possible time.
 - 3. The prequalification information is to include the following:
 - a. Name, educational background and years of service experience for all service personnel.
 - 4. The control panel manufacturer shall have an adequate parts and service facility.
 - 5. The equipment supplier shall:
 - a. Act as an advisor in assisting the Contractor regarding the unloading and move-in operations.
 - b. Ship the specified equipment in a manner that will allow the Contractor to use the equipment he has onsite to efficiently unload the equipment. Supplier is responsible to coordinate handling and delivery of the shipment with the Contractor.
- B. Tests:
 - 1. Field testing and checkout of installation to be approved by manufacturer's field representative.
 - 2. Manufacturer's field representative(s) shall perform at a minimum the following and verify all meet specifications:
 - a. Visibly check entire installation of units:
 - 1) Check ease of pump removal and proper seat between pump and connecting pipe.
 - b. Run each unit with water up to operating speed and temperature and visually check performance across entire operating range:
 - 1) Check proper rotation of units.
 - 2) Check for excessive vibration and noise.
 - 3) Verify all wiring connects and conduct a full functional test of the pumping systems verifying all sequence and level controls.
 - c. Electrical motor test of each unit on each phase:
 - 1) Insulation resistance of winding phase to ground.
 - 2) Resistance readings of windings phase to phase.
 - 3) Running amperage.
 - 4) Inrush amperage.
 - 5) Voltage phase to phase.

- d. Verify all wiring connections and conduct a full functional test of the pumping systems verifying all sequence and level controls.
- 3. Any spare parts used during start-up must be replaced prior to final acceptance.

C. Manufacturer's field service:

- 1. Qualified field personnel to assist in startup and operator training.
Representative(s) shall be available within two (2) weeks of request of services and shall be onsite for a period of not less than three (3) working days and shall include a minimum of two (2) trips to perform the following:
 - a. Inspect completed installation.
 - b. Supervise initial startup, adjustments, and testing.
 - c. Instruct Owner's personnel in proper operation and maintenance.
- 2. Manufacturer's field representatives are to furnish a written report confirming the equipment:
 - a. Has been properly installed and lubricated.
 - b. Is in accurate alignment.
 - c. Is free from undue stress imposed by connecting piping or anchor bolts.
 - d. Has been operated satisfactorily under full-load conditions.
 - e. Personnel trained in all operations.

END OF SECTION

SECTION 15060

PIPE AND PIPE FITTINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. All piping not covered in specific sections of the specifications.
2. Provide piping complete with all fittings, gaskets, jointing materials, supports, saddles, anchors, and necessary appurtenances.
3. Pipe insulation miscellaneous accessories.
4. Miscellaneous accessories and items.

B. Related sections:

1. Related Work specified elsewhere:
 - a. Earthwork: Section 02200
 - b. Anchor Bolts and Expansion Anchors: Section 05501
 - c. Miscellaneous Metal: Section 05999
 - d. Painting: Section 09900
 - e. Mechanical Work – General Requirements: Section 15010
 - f. Valves, Cocks, Hydrants, and Accessories: Section 15100
 - g. Check Valves: 15109

1.02 REFERENCES

A. Referenced standards:

1. ANSI/AWWA C900: Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 inches through 12 inches For Water Distribution.
2. ANSI/AWWA C907: Standard for Polyvinyl Chloride (PVC) Pressure Fittings for Water - 4 inches through 8 inches.
3. AWWA M23: PVC Pipe Design and Installation Manual.
4. ASTM A307: Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi tensile strength.
5. ASTM D297: Standard Test Methods for Rubber Products - Chemical Analysis.
6. ASTM D395: Standard Test Methods for Rubber Property - Compression Set.
7. ASTM D412: Standard Test Methods for Rubber Properties in Tension.
8. ASTM D2240: Standard Test Methods for Rubber Properties - Durometer Hardness.
9. ASTM D1330: Rubber Flange Gaskets Grade I.
10. ASTM F439 - Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
11. ASTM F441 - Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.
12. ASTM F477: Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

13. ASTM D1785: Standard for Manufacture Polyvinyl Chloride Pipe Schedule 40, 80 and 120.
14. ASTM D1784: Standard for Manufacture Polyvinyl Chloride Pipe.
15. ANSI B.16.18-84: Cast Copper Alloy Solder-Joint Pressure Fittings.
16. ANSI B16.22-86: Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
17. ASTM B447-88: Standard Specification for Welded Copper Tube
18. ASTM B642-88: Welded Copper Alloy USNS No. C21000 Water Tube.
19. ASTM D2467: Specification for Socket-Type Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

B. Requirements of regulatory agencies:

1. In accordance with all municipal codes and ordinances, laws and regulations of the State.
2. In case of apparent conflict, State and local requirements govern over these specifications.
3. In absence of State and local regulations, National Plumbing Code applies.

1.03 SUBMITTALS

A. Product Data and Shop Drawings:

1. Sufficient data to verify compliance with the specifications.
2. Shop Drawing showing dimensions, sizes, location.
3. Detailed Shop Drawings for all pipe 4-inch size and larger.
4. Schematic Shop Drawings for all pipe under 4 inches in size.
5. Product Data: Describe materials, pipe, fittings, and gaskets.
6. Manufacturer's published installation instructions.
7. Solvent Cement:
 - a. Product Data.
 - b. Copies of solvent cement manufacturer's report and certification in accordance with ASTM D 2564 for PVC piping, and ASTM F 493 for CPVC piping.

1.04 QUALITY ASSURANCE

- A. Plastic Pipe in Potable Water Applications: Provide pipe and tubing bearing NSF seal.
- B. Mark plastic pipe with nominal size, type, class, schedule or pressure rating, manufacturer and all markings required by applicable ASTM and AWWA standards.
- C. PVC Piping, Schedule Type: Mark pipe and fittings in accordance with ASTM D1785.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Packing and shipping:

1. To ensure undamaged condition.
2. Use wide bearing area slings and wide padded skids.
3. Do not use bare cables, chains, hooks, metal bars, or narrow skids.

4. Support on padded saddles not less than 12 inches wide.
5. Laterally support ends of pipe, fittings, and specials to maintain shape.
6. Separate materials so they do not bear against each other.
7. Securely fasten load to prevent movement in transit.

B. Acceptance at site:

1. Reject products with dents, kinks, abrupt changes of curvature or other injuries.
2. Reject any products dropped from truck or crane.
3. Replace or recondition at Contractor's expense rejected items.
4. Reconditioning subject to Engineer's acceptance.
5. Replace coatings as originally specified on reconditioned pipe.

1.06 PROJECT/SITE CONDITIONS

- A. Environmental requirements: See Section 02000

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable manufacturers are shown under Section 2.02, Materials, for the various types of pipe, and pipe fittings.

2.02 MATERIALS

A. Copper tubing:

1. Potable and non-potable water tubing: ASTM B88; FS WW-T-799, Type K; or FS WW-T-775.
2. Fittings:
 - a. Flared: ANSI B16.26
 - b. Solder: ANSI B16.18 or B16.22.
 - c. Compression: Crawford "Swagelok," Hoke "Gyrollok," Imperial "Hi-Seal," Parker-Hannifin "CPI," Weatherhead "Self-Align," or equal.
 - d. Insulating:
 - 1) Threaded: PSI "Delrin Insulating Couplings," Vallet "V-Line Insulating Couplings," or equal.
 - 2) Flanged: Epco "Dielectric Flange Unions," PSI "Type E Flange Insulation," or equal.
3. Solder: Solid wire, ASTM B32, Alloy Grade 50A (50-50).
4. Soldering flux: Paste-type, FS 0-F-506, Type I, Form A.
5. Brazing filler metal: ASTM C260, BCuP-5; Engelhard "Silvaloy 15," Goldsmith "GB-15," Handy and Hardman "Sil-Foss," or equal.
6. Brazing flux: Paste-type, FS 0-F-499, Type B.
7. Flanges: Cast bronze, 150 lb, brazed joint, ANSI B16.24.
8. Flange bolts and nuts: As specified for steel pipe.
9. Flange gaskets: As specified for steel pipe, except full face.
10. Expansion joints: Flexonics "Model HB Expansion Compensators," Mercer, or equal.

F. Polyvinyl chloride (PVC) pipe:

1. Chemical and water service:
 - a. Pipe: ASTM D1785, Schedule 80, PVC 1120, with NSF seal.
 - 1) Pipe and Fittings: Extruded from Type I, Grade 1, Class 12454 B material in accordance with ASTM D 1784.
 - b. Fittings: ASTM D2464 or D2467, PVC Type I.
 - c. Acceptable manufacturers:
 - 1) Celanese.
 - 2) Chemtrol.
 - 3) Harvel Plastics.
 - 4) Certainteed Pipe.
 - 5) M&T Plastics.
 - 6) Or equal.
 - d. Flanges: Diameter and drilling per ANSI B16.5, 150 lb.
 - e. Unions:
 - 1) Unions 2 1/2 Inches and Smaller: Socket end screwed.
 - 2) Unions 3 inches and larger: Socket flanges with 1/8 inch full face soft gasket compatible with chemical service. For general usage (non-chemical), use neoprene gaskets.
 - f. Water Service:
 - 1) Flange bolts and nuts: ASTM A307, Grade B, galvanized unless specified otherwise, install such that after installation bolts will project 1/8-inch to 3/8-inch beyond outer face of nut.
 - a) Flanged bolts and nuts shall be Type 316 stainless steel for the following conditions:
 - (1) Submerged in water or wastewater.
 - (2) In an enclosed space above wastewater.
 - (3) Buried.
 - 2) Flange gaskets: Full face, 1/8-inch thick, neoprene or plasticized PVC.
 - 3) Expansion joints: Belmont "Style 3915," Resistoflex "Style R6905," molded expansion joint, or equal.

G. PVC gravity sewer (SDR) pipe:

1. Drain and sewer services.
2. Pipe: ASTM D3034-SDR26.
3. Joints: Integral bell and spigot with elastomeric gasket.
4. Acceptable manufacturers:
 - a. Certainteed, Fluidtite IB.
 - b. J-M Pipe, Ring-Tite.
 - c. PW Pipe, Twinseal.
 - d. Or equal.

H. PVC pressure pipe (C900):

1. Sewer forcemain service.
2. Pipe: AWWA C900.
3. Pressure Class: 150.
4. Fittings: Cast and ductile iron.

5. All joints to be restrained
6. Acceptable manufacturers:
 - a. Certaineed, Vinyl Iron.
 - b. J-M Pipe, C900.
 - c. PW Pipe, C900.
 - d. Vinyltech, C900.
 - e. Flex Lox, C900.
 - f. Or equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General:

1. Install where indicated on Drawings.
2. Provide unions where required for equipment removal, indicated on the Drawing or specified.
3. Do not install piping to obstruct openings and passageways.
4. Cut pipe to measurement taken at the site, not from the Drawings.
5. Provide taps for pressure-gauge connections with a nipple, snubber, and gauge cock where indicated on Drawings.
6. Slope drain piping a minimum of 1/4 inch per foot.
7. Install plant drain piping on a uniform grade between manholes with no dips or sags.

B. Joints:

1. Make pipe joints carefully and neatly.
2. Threaded:
 - a. ANSI B2.1, NPT fully and cleanly cut with sharp dies.
 - b. No more than three (3) threads exposed after installation.
 - c. Ream pipe ends after threading to remove burrs.
 - d. Apply thread tape to joints in all plastic and stainless steel piping.
 - e. Apply thread tape or joint compound to joints in other piping.
3. Compression:
 - a. Cut pipe ends squarely, remove burrs.
 - b. Scratches or grooves in tubing are not allowed.
4. Flared:
 - a. Cut tubing ends squarely; remove burrs.
 - b. Scratches or grooves in flared ends are not allowed.
5. Soldered and brazed:
 - a. Solder or braze lines smaller than two (2) inches where solder fittings are specified, except for aluminum pipe or fittings.
 - b. Thoroughly clean joint surfaces with flint paper and coat with thin film of flux.
 - c. Install tubing to full depth of socket.
 - d. Do not overheat metal or flux.
 - e. Uniformly heat joint to melt filler metal on contact.
 - f. Remove surplus filler metal and flux while joint is still hot.
6. Bell and spigot:

- a. Install as recommended by manufacturer.
- b. 12 inches and smaller outlets, where minimum line is at least twice the diameter of the branch; tee or a tapping saddle is acceptable.
- c. Mark the centerline of each flange and mechanical joint piece on ductile iron pipe.
- d. Finish machine pipe ends and flange faces flat and perpendicular to pipe centerline in a single operation on ductile iron pipe.
7. Flanged: Tighten bolts sufficiently to slightly compress gasket in accordance with manufacturer's instructions, but not so tight as to distort flanges.
8. Welded: ANSI B31.1 and per "Code for Pressure Piping."
9. Solvent Welded PVC and CPVC Piping:
 - a. Clean dirt and moisture from pipe and fittings.
 - b. Bevel pipe ends in accordance with manufacturer's instructions with chamfering tool or file. Remove burrs.
 - c. Use solvent cement and primer formulated for PVC or CPVC as applicable.
 - d. Use primer on pressure and non-pressure joints.
 - e. Do not solvent weld joints when ambient temperatures are below 40 degrees Fahrenheit or above 90 degrees Fahrenheit unless solvent cements specially formulated for these conditions are utilized.
10. Joint deflection on PVC: Zero degrees.

C. Pipe supports:

1. Provide adequate pipe supports for all piping.
2. Utilize pipe supports as shown on the pipe support details.
3. Provide pipe supports at locations shown on the plans, as well as additional supports required to meet these maximum spacings:
 - a. Maximum pipe support for PVC pipe:

<u>Pipe Size</u>	<u>Maximum Spacing</u>
1" or less	4'-0"
1-1/4" - 2"	6'-0"
2-1/2" - 3"	7'-0"
3-1/2" & larger	8'-0"

4. Maximum pipe support for miscellaneous metallic piping:

<u>Pipe Size</u>	<u>Maximum Spacing</u>
1" or less	5'-0"
1" & larger	7'-0"

3.02 TESTING SEWER

- A. Refer to the El Dorado Irrigation District Standard Specifications for testing. These specifications can be found at <http://www.eid.org/doing-business-with-eid/design-and-construction-standards>.

3.03 CLEANING

- A. General:

1. The inside of all pipe, valves, and fittings shall be smooth, clean, and free from blisters, loose mill scale, sand, and dirt when erected.
2. Flush all lines prior to placing into service or prior to tie-in.

END OF SECTION

SECTION 15100
VALVES AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Valves, cocks, hydrants, and accessories, indicated on the Drawings specified or required for proper operation of equipment or systems.
 - 2. Various mechanical accessories as required.
- B. Related sections:
 - 1. Related Work specified elsewhere:
 - a. Pipe and Pipe Fittings: Section 15060
 - b. Check Valves: Section 15109

1.02 REFERENCES

- A. Reference standards:
 - 1. AWWA C500: Valves.
 - 2. ANSI B16.1: Flanged Fittings.
 - 3. ANSI B 21.11: Ductile Iron Fittings.
 - 4. ASTM A36: Steel.
 - 5. ASTM A123: Galvanized Steel
 - 6. ASTM 126-B: Cast Iron.
 - 7. ASTM A536, GR .65-45-12: Ductile Iron.
 - 8. ASTM B21-CA 469: Bronze Seats.

1.03 SUBMITTALS

- A. Catalog data: Submit manufacturer's literature and illustrations sufficient to verify compliance with the specifications.
- B. Shop Drawings:
 - 1. Dimensions.
 - 2. Construction details.
 - 3. Materials.
 - 4. Assembled weight.
 - 5. Schedule for all items included in this section.
- C. Installation instructions

- D. Maintenance data:
 - 1. Operation and Maintenance Manuals.
 - 2. Parts lists.

- E. Test reports.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves and accessories for shipment according to AWWA C500:
 - 1. Seal valve ends to prevent entry of foreign matter into valve body.
 - 2. Box, crate, completely enclose, and protect valves and accessories from accumulations of foreign matter.
- B. Storage and protection:
 - 1. Store valves out of traffic.
 - 2. Cover and protect as recommended by manufacturer.

1.05 PROJECT/SITE CONDITIONS

- A. Environmental requirements: See Section 02000

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable manufacturers:
 - 1. Gate valves:
 - a. Threaded end:
 - 1) Red-White.
 - 2) Watts.
 - 3) Nibco.
 - 4) Milwaukee.
 - 5) Stockham.
 - 6) Or equal.
 - b. Flanged ends:
 - 1) American Darling.
 - 2) Kennedy.
 - 3) Mueller.
 - 4) Or equal.

2.02 MATERIALS

- A. General:
 - 1. Construction:
 - a. Actual valve length within $\pm 1/16$ -inch of specified length.

- b. Ends, except as otherwise specified:
 - 1) 2-1/2 inches and smaller; threaded.
 - 2) 3 inches and larger: Flanged, ANSI 125 lb.
- 2. Shop painting:
 - a. Asphalt varnish: AWWA Standards and Federal Specification TT-V-51.
 - b. Coal tar: Koppers "Bitumastic Super Tank Solution," Tnemec.
 - c. Epoxy: Mobil "78-D-7 Tank Lining Epoxy," Tnemec "Series 139 Pota-Pox."
 - d. Rust-inhibitive primer: Mobile "13-R-50 Chromox Q.D. Primer," Tnemec "135 Chem-Build."
 - e. Rust-preventive compound: Houghton "Rust Veto 344," Rust-Oleum R-9."
- 3. Actuators:
 - a. Provide manual actuators for all valves not specified to be power-actuated or designed for automatic operation.
 - 1) Buried or below grade valves, valves operated through floor boxes, and as indicated on Drawings: 2" Operator nuts:
 - a) AWWA C500.
 - b) Provide one (1) operating key per valve (per type of valve, six (6) keys maximum.)
 - c) Valve position indicator.
 - 2) Valves not to be chainwheel or wrench-nut operated:
 - a) Six (6) inches and smaller: Lever; provide two (2) operating levers of each required size.
 - b) Eight (8) inches and larger: Handwheel.
 - b. Rotation:
 - 1) Counterclockwise (to the left) to open.
 - 2) The word "OPEN" and an arrow indicating the direction to open cast on each valve body or operator.
- c. Extension stems:
 - 1) Provide where indicated on Drawings, specified, and required for proper operation.
 - 2) Provide a valve extension where more than 30 inches below grade.
 - 3) Non-rising stems:
 - a) Solid steel shafting with OD not less than OD of valve stem or galvanized steel pipe with ID not less than OD of valve stem.
 - b) Connected to the valve by a flexible socket coupling.
 - c) All other connections pinned, keyed, or socket.
 - 4) Rising stems:
 - a) Stainless steel or carbon steel shafting with OD not less than OD of valve stem.
 - b) Bronze or stainless steel sleeves securely attached to stem.
 - c) Sleeve length and location to extend through each stem guide throughout the full vertical travel of the stem.
 - 5) Stem guides:
 - a) Cast iron, bronze bushed, adjustable in two (2) directions.
 - b) If extension stem length exceeds 10 feet or the weight exceeds 20 lbs, design top guide to carry the stem weight and provide a collar on the stem to bear against the thrust guide.
 - c) Maximum spacing:
 - (1) Non-rising stems: 100 times stem OD.
 - (2) Rising stems: 60 times stem OD.
 - (3) Ten (10) feet maximum.

- d. Operating stands:
 - 1) Provide as indicated on Drawings.
 - 2) Fabricated steel or cast iron.
 - 3) Support the handwheel or lever approximately 36 inches above the floor or as indicated on Drawings.
 - 4) Handwheel diameter: 14 to 16 inches minimum.
 - 5) Provide a standard weight galvanized pipe sleeve for stem opening in the floor.
 - 6) For longer than ten (10) feet and without stem guides with thrust bearings provide a suitable thrust bearing in each stand to carry extension stem weight.
- e. Floor boxes:
 - 1) Provide when openings are provided in concrete slabs for key operation of wrench nuts in or below the slab.
 - 2) Cast iron with cover.
 - 3) Depth as required for slab.
 - 4) Nut in slab: Provide a stem guide to center nut in box.
 - 5) Nut below slab: Bottom opening to permit passage of key.
 - 6) Box and cover coated by dipping in asphalt varnish.
 - 7) Valve position indicator.
- f. Valve boxes:
 - 1) Provide where indicated on Drawings.
 - 2) Cast iron extension sleeve type with boxes and covers.
 - 3) Tyler Pipe 6850 Series, or equal.
 - 4) Minimum diameter: 5 inches.
 - 5) Minimum thickness: 1/4-inch.
 - 6) Box, cover and base coated by dipping in asphalt varnish.
 - 7) Lid: No marking.
- g. Valve, Gate, and Operator Bolts and Nuts: Unless specified elsewhere, provide the following:
 - 1) Fabricated of stainless steel for the following installation conditions:
 - a) Submerged in sewage or water.
 - b) In an enclosed space above sewage or water.
 - c) In structures containing sewage or water, below top of walls.
 - d) At openings in concrete or metal decks.
 - 2) Where dissimilar metals are being bolted, use stainless steel bolts with isolation bushings and washers.
 - 3) Underground Bolts: Low-alloy steel in accordance with AWWA C 111/A21.11.

B. Gate valves:

- 1. Smaller than three (3) inches or installed in vertical lines: Solid wedge type, Class 150, union bonnet.
- 2. In structure: Rising stem with stuffing box stem seals.
- 3. Buried or submerged: Non-rising stem with O-ring stem seals.
- 4. Threaded end: Watts Series FGV-UB, Nibco T-134, Milwaukee 1151, Red-White 298, Stockham B-120, or equal.
- 5. Soldered end: Nibco S-134, Stockham B-124, Milwaukee 1169, Red-White 299 or equal.

6. Flanged end over 4 inches: Fusion-bonded epoxy lined and coated per AWWA C515, American-Darling CR5-80, Kennedy Ken-Seal, Mueller A-2370, American R/D 2000, or equal.

C. Ball valves:

1. Application:
 - a. Except as otherwise indicated or specified, provide ball valves for all 2-1/2 inch or smaller shutoff valves.
 - b. Provide additional ball valves as indicated on Drawings or as specified.
2. Air and water service, 2 inches and smaller: Bronze body, 316 stainless steel ball and stem, Milwaukee BA-1005, Nibco T-580-66, Watts Series B6000SS, Stockham 5-216-SSM0, or equal.
3. Air and water service, 2-1/2 inches and larger: Crane "Hiflex 81202," Jamesbury D150F-21, Walworth C4100F, BANJO SS316, or equal.

D. Hose valves and hydrants:

1. Interior locations:
 - a. 3/4-inch hose faucets (hose bibbs).
 - b. Acceptable manufacturers:
 - 1) Nibco 63.
 - 2) Prier Brass C-35ST.
 - 3) Tanner 907.
 - 4) Or equal.
2. Yard hydrants: Freeze-proof, post-type.
 - a. Acceptable manufacturers:
 - 1) Josam 71700.
 - 2) Wade W-8610.
 - 3) Smith 5910.
 - 4) Zurn 1385.
 - 5) Or equal.
3. Hose hydrants (1-1/2 inch):
 - a. Type:
 - 1) Angle valve.
 - 2) Outlet: Hose thread.
 - 3) Inlet: FPT.
 - 4) Bronze cap and chain.
 - 5) Hand wheel.
 - b. Acceptable manufacturers:
 - 1) James Jones.
 - 2) Wade.
 - 3) Or equal.
4. Hose connection:
 - a. Hose thread.
 - b. 3/4-inch or 1-1/2 inch as indicated on the Drawings.
 - c. Provide 1-1/2 x 3/4 thread reducer at each 1-1/2 inch hose hydrant.

E. Pressure gauge:

1. Installation shall include a gauge cock and gauge.

2. Case 100 mm diameter.
3. Stainless steel, liquid filled.
4. Stainless steel bourdon tube.
5. Black figures on a white dial.
6. Shatterproof glass or acrylic window with glycerin or mineral oil filled dial.
7. Acceptable manufacture:
 - a. Ametek, Series 656.
 - b. M&G.
 - c. Or equal.
8. Diaphragm gauge protector:
 - a. Provide at all gauges except PW or NPW service.
 - b. Chemical service: M&G model SB diaphragm seal with 1/4-inch instrument connection and 1/2-inch process connection; steel top, nuts and bolts; PVC bottom, teflon diaphragm.
 - c. Service: Sludge pressure sensor as specified in paragraph W below.
9. Snubbers:
 - a. Snubbers: Type 303 stainless steel housing and Type 316 stainless steel filter disc as manufactured by Operating and Maintenance Specialties "Ray Snubbers" Model 010, Ashcroft Series 1112 S, or equal.
10. Gauge Cocks:
 - a. PW and NPW Service: Bronze, tee handle; Lunkenheimer 1178, Powell 915, or equal.
 - b. Gages in Chemical, Sewage, and Sludge Service: Type 316 stainless steel with tee handle.

2.03 FABRICATION

A. Surfaces to be painted:

1. Shop-paint all ferrous metal surfaces of valves and accessories, both interior and exterior, for corrosion protection.
2. Manufacturers standard paint will be acceptable.
3. Interior: Epoxy two (2) coats (12 mils). Do not coat rubber components.
4. Exterior to be buried, submerged, or located in manholes: Asphalt varnish or coal tar.
5. Polished or machined surfaces: Rust-preventive compound.
6. Stainless steel will not be shop painted.

2.09 SOURCE QUALITY CONTROL

A. Tests:

1. Each valve to be tested in accordance with AWWA C500 standards.
2. Provide performance tests.
3. Perform hydrostatic tests.
4. Perform leakage tests.
5. Perform pressure tests.

B. Records:

1. Submit certified copies of test results.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General:

1. Install valves and accessories in accordance with the manufacturer's recommendation.
2. Provide a union or flanged connection within two (2) feet of each threaded end valve unless the valve can otherwise be easily removed from piping.
3. Set valve and valve boxes plumb.

3.02 ADJUSTING

- #### **A.**
- Check and adjust valves and accessories for smooth operation in accordance with manufacturer's instructions.

END OF SECTION

SECTION 15109

CHECK VALVES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Provide check valves for potable water service, non-potable water service, chemical service and sewer service as indicated on the Drawings.
 - 2. Include all necessary accessories for proper operation of equipment or systems.
- B. Related sections:
 - 1. Related Work specified elsewhere:
 - a. Painting: Section 09900
 - b. Pipe and Pipe Fittings: Section 15060
 - c. Valves, Cocks, Hydrants, and Accessories: Section 15100

1.02 REFERENCES

- A. Reference standards:
 - 1. AWWA C508 Series: American Waterworks Association Standards.
 - 2. ANSI B16.5.
 - 3. ASTM A351.
 - 4. ASTM A226.

1.03 SUBMITTALS

- A. Product Data:
 - 1. Catalog data sufficient to verify compliance with the Specifications.
- B. Shop Drawings:
 - 1. Dimensions.
 - 2. Construction details.
 - 3. Materials.
 - 4. Assembled weight.
- C. Installation instruction: Complete manufacturer's installation instructions.
- D. Operation and Maintenance manuals.
- E. Test reports:
 - 1. Test reports from factory.

2. The manufacturer's certification of materials used in the manufacture.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Packing and shipping:

1. Prepare valves and accessories for shipment in accordance with AWWA C508.
2. Remove dirt, rocks, debris, and other foreign materials from inside the body of the valve.

B. Storage and protection:

1. Take precautions to protect spring and balance arm from damage.
2. Cover valve ends to protect seat disc and trim.

1.05 PROJECT/SITE CONDITIONS

- ##### **A. Environmental requirements: See Section 02000**

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable manufacturers:

1. Mueller
2. AFC
3. APCO

2.02 MATERIALS

- A. Resilient seat, swing type
- B. Body Seat Ring: Stainless Steel
- C. Epoxy lined and coated
- D. Body: Ductile Iron
- E. Disk: Ductile Iron
- F. Shafts: 316 stainless steel

2.03 SOURCE QUALITY CONTROL

A. Tests:

1. Conduct performance tests, leakage tests, and hydrostatic tests as per AWWA C508 Series.
2. Provide certified copies of test results.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General:

1. Install valves and accessories in accordance with the manufacturer's recommendation.
2. Provide a union or flanged connection within 2 feet of each threaded end valve unless the valve can otherwise be easily removed from piping.
3. Set valve level

3.02 ADJUSTING

- #### **A.**
- Check and adjust valves and accessories for smooth operation in accordance with manufacturer's instructions.

END OF SECTION

SECTION 16010

ELECTRICAL

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall install, ready for use, the electrical system as specified herein and shown on the Contract drawings. This document describes the function and operation of the system and particular components, but does not necessarily describe all necessary devices. All components and devices shall be furnished and installed as necessary to provide a complete operable and reliable system for accomplishing the functions and meeting the performance set forth hereinafter. The "Owner" in Division 16 shall be defined as the "Engineer".
- B. Furnish all required labor, materials, project equipment, tools, construction equipment, safety equipment, transportation, test equipment, incidentals and services to provide a complete and operational electrical system as shown on the Electrical-Series (E-Series) Contract Drawings, included in these Specifications, or necessary for fully operating facility.
- C. Examine the specification and Drawings for mechanical equipment and provide all circuit breakers, switches, pushbuttons and appurtenances which are not specified to be with the mechanical equipment. Erect all electrical equipment not definitely stated to be erected by others, furnish and install conduit, wire and cable and make connections required to place all equipment in complete operation.
- D. It is recommended that the Electrical Contractor attend the job walk for the site and shall have accomplished the following:
 - 1. Thoroughly examine existing conditions before submitting his bid proposal to perform any work. He shall compare site conditions with data given on the plans or in these Specifications. No allowance shall be made for any additional costs incurred by the Contractor due to his failure to have examined the site or to have failed to report any discrepancies to the Owner prior to bid.
 - 2. It is the Contractor's responsibility to be fully familiar with the existing utility locations, conditions and local requirements and regulations.
 - 3. Verify all measurements and conditions and shall be responsible for the correctness of same. No extra compensation will be allowed because of differences between Work shown on the Drawings and measurements at the site.

- E. Any major deviations in location and conduit routing that the Contractor makes without the express written review or direction of the Engineer, shall be considered to have been made at the Contractor's sole responsibility.
 - 1. Such deviations made by the Contractor shall be reflected on the Contractor supplied "Record Drawings."
 - 2. The Owner will reimburse the Engineer and the Owner will then deduct an amount equal to said reimbursement from the Contractor's contract for all engineering, drafting, and clerical expenses associated with updating the Record Drawings due to any major unauthorized changes.
- F. The major areas in the scope of work as illustrated on E-series Contract drawings and Device Index located in Appendix "B", which includes both the furnishing and installation are:
 - 1. Madrone Lift Station: (Bid Alternate Item)
 - a. Meter/Main, motor starters, panelboard transformer and associated hardware
 - b. Programmable logic controllers (PLC), Operator Interface (OI) and other new hardware, components and programming for controlling the pumps, etc. and other miscellaneous devices.
 - c. Instrumentation.
 - d. Circuit breakers and panelboard transformer.
 - e. Equipment for relocated telephone and utility power services.
 - f. Secondary conduits & wire, bollards, pull boxes, etc. per PG&E Engineered Drawings for the relocated utility power service. All work associated with power Utility Service not performed by Utility Company.
 - g. New area lights.
 - h. Antenna System
 - i. PLC programming, OI configuration, Central SCADA graphic screens, Autodialer configuration, and modifications to existing Central System to incorporate Madrone shall be by Contractor.
 - 2. Giovanni Lift Station
 - a. Meter/Main, automatic transfer switch (ATS), motor starters, panelboard transformer and associated hardware
 - b. Programmable logic controllers (PLC), Operator Interface (OI) and other new hardware, components and programming for controlling the pumps, etc. and other miscellaneous devices.
 - c. Instrumentation.
 - d. Circuit breakers and panelboard transformer.

- e. Equipment for relocated telephone and utility power services.
 - f. Secondary conduits & wire, bollards, pull boxes, etc. per PG&E Engineered Drawings for the relocated utility power service. All work associated with power Utility Service not performed by Utility Company.
 - g. New area light.
 - h. Antenna System
 - i. PLC programming, OI configuration, Central SCADA graphic screens, Autodialer configuration, and modifications to existing Central System to incorporate Giovanni shall be by Contractor.
3. Installation, mounting supports, wiring, start-up, and testing of new and relocated systems.
 4. Conduits and the field interconnection wiring between the Pedestal, Control Panels, instrumentation, etc. existing equipment and equipment provided under all other Divisions.
 5. Provide all necessary conduits, junction boxes, grounding system, field interconnection wiring, hardware, fittings, and devices to connect the designated equipment and wiring.
 6. All necessary miscellaneous shut off, sample, and calibration valves to sensors.
 7. Provide trenching, backfilling, and compaction for all underground conduit routes, concrete pads, and pull boxes.
 8. Concrete pads and supports for electrical and instrumentation equipment.
 9. Remove and dispose of all excess dirt, paving, concrete, and other materials from site work.
 10. Reuse existing cellular modems in new control panels.
- G. Existing site is limited in space. It is the Contractor's responsibility to provide an electrical and instrumentation package to fit in the allocated space.
 - H. Contractor shall field verify existing conditions as required to complete the project.
 - I. The following specifications incorporate specific equipment and devices that are preferred by the Owner because of their serviceability, to match existing equipment, because of the local availability of labor, parts and materials, or because of the ability of the Owner to umbrella the equipment under existing maintenance contracts.
 - J. All electrical work shall conform with the National Electric Code (NEC) 2014 issue. Nothing on the Drawings or in the Specifications shall be construed to permit work or materials not conforming to these codes and standards.

- K. All panels, panelboards, panelboard transformers, PLC hardware, etc. shall be supplied by one System Supplier. All panels and instrumentation listed in Division 16 Appendix B-Device Index shall be supplied by the same System Supplier. This includes, but is not limited to all work necessary to select, furnish, supervise installation, calibrate, program, and place into operation all transmitters, instruments, controllers, alarm equipment, monitoring equipment, and accessories as specified herein.

1.02 CODES AND STANDARDS

- A. All electrical/instrumentation equipment and materials, including installation and testing, shall conform to the following applicable codes and standards:
1. ANSI - American National Standards Institute, Inc.
 2. EIA - Electronics Industries Association.
 3. ETL - Electrical Testing Laboratories.
 4. FM - Factory Mutual.
 5. GO128 - General Order No. 128, Rules for Construction of Underground Electrical Supply and Communication Systems, Public Utilities Commission of the State of California.
 6. IEEE - Institute of Electrical and Electronics Engineers.
 7. ICEA - Insulated Power Cable Engineers' Association.
 8. ISA - International Society of Automation (ISA) Standards (formerly Instrument Society of America).
 9. NEC - National Electrical Code, 2014 Edition.
 10. NEMA - National Electrical Manufacturers Association.
 11. NETA - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems, International Electrical Testing Association.
 12. NESC - National Electrical Safety Code.
 13. NFPA - National Fire Protection Agency & NFPA820
 14. OSHA - Occupational Safety and Health Act Standards.
 15. UL - Underwriter's Laboratories, Inc.
- B. The revisions of these codes and standards in effect on the date of issuance of the Contract Documents shall apply.
- C. Codes and standards referenced shall be considered minimum acceptable work.

- D. In instances where two or more codes are at variance, the most restrictive requirements shall apply.
- E. Nothing on the Drawings or in the Specifications shall be construed to permit work or materials not conforming to the preceding codes and standards.
- F. All work shall also be performed in accordance with the Owner, State, County or Owner standards, and local Utility codes.
- G. The Contractor shall furnish without extra charge any additional material and labor which may be required for compliance with these codes and standards, even though the work is not explicitly mentioned in the Specifications or shown on the Contract E- Series Drawings.

1.03 RELATED WORK IN OTHER SECTIONS

- A. Provide an electrical system that interfaces to work performed under other Mechanical and Equipment Sections of these Specifications.
- B. The following is part of Division 16:
 - 1. Section 16605 – Electrical Systems Analysis.
 - 2. Section 16915 – Control Strategies.

1.04 ELECTRICAL CONTRACTOR QUALIFICATIONS

- A. It is the intent of this Division that the complete responsibility for management and installation of the electrical and instrumentation required for this project be by a qualified Electrical Contractor. This responsibility includes, but not limited to, supervision and coordination of work performed by all suppliers of Division 16.
- B. Uncertified electricians shall not perform electrical work for which certification is required per Labor Code Section 3099. Electricians shall be required to carry proof of certification on their person at all times. Electricians found on the jobsite without proof of certification will be asked to leave, prohibited from working on-site until proof of certification has been provided and may be reported to the Contractors State License Board (CSLB).
- C. Contractor shall submit the proposed Electrical Subcontractor and System Supplier with bid documents that will be used on this project.
- D. If the Contractor, Electrical Subcontractor, and System Supplier listed in bid documents are deemed not qualified by Owner, they will have their bid rejected at the Owner's sole discretion and the next qualified bidder selected.
- E. The Electrical Subcontractor shall meet the following minimum qualifications:
 - 1. Has a current C-10 Electrical Subcontractor's License.
 - 2. Has regularly engaged in similar electrical contracting for the Municipal Water Industry.

3. Has successfully performed work of similar or greater complexity on at least two previous projects under one company name and under the present company name.
 4. Has all persons performing work as electricians certified by the California Apprenticeship Council per California Labor Code Section 3099.
 5. Has been actively engaged in the type of electrical and instrumentation work specified in this Division for a minimum of two years.
- F. Bid package shall include a list of five (5) completed projects of similar size and nature for sewer lift stations the Electrical Contractor has completed:
1. Provide completion dates of projects.
 2. References of Owner Representative in charge of project, including contact name and telephone number.

1.05 SYSTEM SUPPLIER QUALIFICATIONS

A. General:

1. It is the intent of this Division that complete responsibility in the supplying of the Pedestal/PLC, PLC programming and all instrumentation listed herein and other equipment required for this project be supplied by one System Supplier. This responsibility includes, but not limited to, all work necessary to select, furnish, program, supervise installation, calibrate, and place into operation all transmitters, instruments, controllers, alarm equipment, monitoring equipment, and accessories as specified herein.
2. The system supplier shall have an on staff project engineer with prior experience on similar sized projects. This project engineer shall coordinate the technical aspects of this project and prepare the submittals and drawings. The system supplier project engineer shall attend all coordination meetings and be on-site when requested by the Owner's Resident Engineer.

B. Pre-Qualified System Suppliers

1. The Suppliers listed below have been determined to meet minimum qualifications specified in this Division and are pre-qualified by the Owner for providing supplier bids as system suppliers on the project.
 - a. Krug-Bixby-Long Associates (KBL) (phone 510 887-1117).
 - b. Tesco (phone 916 395-8800).
 - c. MCC Control Systems (phone 707 449-0341).

C. Non-Pre-Qualified System Suppliers

1. System Suppliers not pre-qualified by the Owner shall submit the information listed herein at least 14 calendar days prior to bid date, and if approved by the Owner, will be listed in a Contract addendum prior to bid.

- a. Company history.
 - b. List of five (5) completed projects of similar size and nature for sewer lift stations.
 - c. Provide completion dates of projects.
 - d. References of Owner Representative in charge of project, including contact name and telephone number.
 - e. List of projects in progress.
 - f. Description of scope of projects.
 - g. Dollar amount of projects.
 - h. References of Owner Representative in charge of project, including contact name and telephone number.
 - i. Complete 2014 Year End Financial statement prepared by a Certified Accountant or complete 2014 Company Tax Returns listing assets and liabilities.
2. Factory test for this project shall be held within 150 miles of project location at the System Suppliers shop.
 3. Additional information for clarification as requested by the Owner in writing shall be provided by the System Supplier asking for the qualification or qualification will automatically be denied.
 4. System Supplier providing financial statements lacking detail or stating that detailed financial records are proprietary will be disqualified as a qualified System Supplier and is grounds alone for disqualification.
 5. Any qualification package deemed incomplete or lacking sufficient information to determine qualification will result in System Supplier not being qualified.
 6. No reason will be released on why a System Supplier was not qualified.

1.06 CONTRACT DOCUMENTS

- A. The Contract drawings and specifications are intended to be descriptive of the type of electrical system to be provided; any error or omissions of detail in either shall not relieve the Contractor from the obligations thereunder to install in correct detail any and all materials necessary for a complete operational system, at no additional cost.
- B. The Contract drawings are generally diagrammatic; exact locations of existing equipment and proposed location for new electrical products shall be verified in the field with the Engineer. Except where special details on drawings are used to illustrate the method of installation of a particular piece or type of equipment or materials, the requirements or descriptions in this Section shall take precedence in the event of conflict.

- C. The Contract Electrical elementary, elevation and one-line diagrams are the basis of the electrical system to be provided and are for reference only. It is the Contractor's responsibility to adjust and make minor revisions to the diagrams as necessary for operational system at no additional cost to the Owner. Additional isolators, relays, wiring, terminal blocks, and appurtenances, shall be provided for an operation system at no additional cost to the Owner.
- D. Location of equipment, inserts, anchors, panels, pull boxes, conduits, stub-ups, and fittings for the electrical system are to be determined by the Contractor and Engineer at time of installation. Contractor shall make minor adjustments to locations of electrical equipment required by existing conditions and coordination with other trades at no additional cost to Owner.
- E. The Conduit and Wire Routing Schedule, wire fill, and number of conduits are based on the best information available.
 - 1. It is the Contractor's responsibility to modify the conduit schedule based upon Shop Drawings for the actual equipment. Such modifications in conduit sizes and numbers of conductors shall be at no additional cost to the Owner, if such changes are the direct result of the equipment selected by the Contractor.
 - 2. A copy of the Conduit Schedule and Electrical plans showing conduit routing shall be updated weekly by the Contractor. Progress payments will be withheld if during monthly checks it is found that the Contractor fails to maintain the Conduit Schedule updates.
- F. Electrical & instrumentation, conduit & wire lengths shown on Contract Drawings are approximate. The Contractor is responsible for determining actual lengths for bidding and installation purposes. Contractor is to be made aware that equipment may be installed in the lower levels of the building.
- G. The Contractor shall examine the architectural, mechanical, structural, electrical and instrumentation equipment provided under other Sections of this Contract in order to determine the exact routing and final terminations for all conduits and cables. The exact locations and routing of cables and conduits shall be governed by structural conditions, physical interferences, and the physical location of wire terminations on equipment. Conduits shall be stubbed up as near as possible to equipment.
- H. All equipment shall be installed and located so that it can be readily accessed for operation and maintenance. The Engineer reserves the right to require minor changes in location of equipment, without incurring any additional costs.
- I. Provide means to furnish equipment and accessories, do the installation, complete connections, submit documentation, perform start-up, and be responsible for the warranty.

- J. Where conduits are shown as "home runs" on the Contract drawings or stated to be furnished, but not explicitly shown, as part of the scope of work; the Contractor shall provide all fittings, boxes, wiring, etc. as required for completion of the raceway system in compliance with the NEC and the applicable specifications in this Section.
- K. No changes from the Contract drawings or specifications shall be made without written approval of the Engineer. Should there be a need to deviate from the Contract documents, submit written details and reasons for all changes to the Engineer for favorable review.
- L. When existing conduits are to be used, it is the Electrical Contractor's responsibility to verify conduit size and routing. This includes all potholing or other location methods. Existing conductors and conduits damaged by Contractor during construction shall be repaired or replaced at no cost to Owner.
- M. The resolution of conflicting interpretation of the Contract documents shall be determined by the Engineer.
- N. The Contractor shall coordinate with other Suppliers on the project for a complete and operable system.
- O. It is the System Supplier's responsibility for obtaining instrumentation transmitter configuration software, manuals and disks necessary for the Contractor to program and configure the instrumentation transmitters.
- P. The Electrical Contractor shall maintain a separate set of neatly and accurately marked set of Record Documents, consisting of spreadsheets, specifications and full size blue-line Electrical (E-Series) and Instrumentation (I-Series) Contract Drawings.
 - 1. These documents are to be used specifically for recording the as built locations and layout of all electrical and instrumentation equipment, routing of raceways, junction and pull boxes, and other diagram or document changes.
 - 2. These Record documents shall be kept up-to-date during the progress of the job, with all "change orders", submittal modifications, and construction changes shown and stamped with "As-Built" at end of job.
 - 3. These Record documents shall not be used for daily construction use and shall not contain any mark-ups that are unrelated to as-built corrections.
 - 4. The following lists the record documents shall be as-built by Electrical Contractor:
 - a. E-Series Drawings.
 - b. Panelboard schedules.
 - c. Conduit and Wire Routing Schedule.

- 1) A copy of the Conduit and Wire Routing Schedule and Electrical plans showing conduit routing shall be updated weekly by the Contractor. Progress payments will be withheld if during monthly checks it is found that the Contractor fails to maintain the Conduit Schedule updates.
- d. Lighting Schedule.
- e. Duct banks and their routing with offset measurement and indicate changes in depth.
5. The following lists the record documents that shall be as-built by System Supplier to be maintained by Electrical Contractor:
 - a. I-Series Drawings
 - b. Instrumentation Index.
6. Record documents shall be kept current weekly with all "change orders," submittal modifications, and construction changes shown. Record Documents shall be subject to the inspection by the Engineer at all times, progress payments or portions thereof may be withheld if Record Documents are not accurate or current.
7. When documents are changed, they shall be marked with erasable colored pencils using the following coloring scheme:
 - a. Additions - red
 - b. Deletions - green
 - c. Comments - blue
 - d. Dimensions - black
8. Show the following on the Electrical (E-Series) Record Contract Drawings by dimension from readily obtained base lines:
 - a. Exact location, type and function of electrical and instrumentation equipment and devices.
 - b. Precise routing and locations of underground conduits, pullboxes, junction boxes, and appurtenances that make-up the raceway system.
 - c. Show the dimensions, location and routing of electrical work, which will become permanently concealed.
 - d. Show complete routing and sizing of any significant revisions to the systems shown.
9. Prior to acceptance of the work, the Contractor shall deliver to the Engineer one set of record full size drawings neatly marked accurately showing the information required above.

1.07 COORDINATION

- A. The Contractor shall coordinate the electrical work with the other trades, code authorities, utilities, and the Engineer; with due regard to their work, and towards promotion of a rapid completion of the project. If any cooperative work must be altered due to lack of proper supervision of such, or failure to make proper provisions, then the Contractor shall bear expense of such changes as necessary to be made in work of others.
- B. Manufacturer's directions and instructions shall be followed in all cases where such is not shown on the Contract Drawings or herein specified.
- C. The Contractor shall coordinate with Owner, and witnessing Engineer to test the entire system.
- D. The electrical and instrumentation modifications and additions are to be made at the operational facility. The Contractor shall schedule all the required work with the Owner, including each shutdown period. Each shutdown shall be implemented to minimize disruption of the existing operations. facility shutdowns may be required outside of normal working hours when facility flow is at minimum. The work to be provided under this Contract shall not disrupt any of the existing operations without prior approval.
 - 1. The Contractor shall limit all scheduled shutdown periods to less than 2 hours (120 minutes) and only with prior approval of the Owner.
 - 2. Carry out scheduled shut downs only after the time, date, and sequence of work proposed to be accomplished during shutdown has been favorably reviewed by the Owner. Submit shutdown schedule and plans at least 10 working days' in advance of when the scheduled shutdown is to occur.
 - 3. Contractor shall make provisions for portable generators and automatic transfer switches when areas of the plant will be without power.
 - 4. The Owner reserves the right to delay, change, or modify any shutdown at any time, at no additional cost to the Owner, when the risk of such a shutdown would jeopardize the operation of system.
 - 5. Contractor is advised that during change out of existing PLC, pumps, demolition of existing conduits, installation of new conduits, etc., Contractor is responsible to keep equipment running for all necessary station operation. The Contractor shall install temporary generators, motor controls, panelboards, power panelboards, wiring, etc. to keep all station equipment powered and automatic controls functional.
- E. Schedule within 20 days after award of Contract all service installations and connections with utilities. Delays due to lack of effort by the Contractor which delay the project completion for lack of utility services will not be considered valid and Contract liquidated damages will be assessed.

- F. The Contractor shall cease work at any particular point, temporarily, and transfer his operations to such portions of work as directed, when in the judgment of the Owner it is necessary to do so.
- G. At the Owner's discretions, Contractor shall stop work for a period of time (without incurring delay costs) in an event where there is a large storm event and the Owner had determined they need to continuously monitor the station. This would be in effect until the bypass piping has been established and operable.
- H. Prior to commencing construction, the General Contractor shall arrange a conference with the General Contractor, Electrical Contractor, System Supplier, Resident Engineer & Owner as well as all equipment and system suppliers vital to the current phase of work. During the meeting, the equipment supplier shall verify types, sizes, locations, installation requirements, controls and diagrams of all equipment furnished. The Equipment and System Suppliers shall, in writing, inform the Engineer that all phases of coordination of this equipment have been covered and if there are any unusual conditions, they shall be enumerated at this time.
 - 1. Before beginning PLC, OI and SCADA. software development for each process area, meet with the Owner for a four-hour Design Definition Meeting at the Owner's facility.
 - a. Ensure that the Contractor Project Manager, System Supplier Engineer, System Supplier software programmer, Engineer & Owner are in attendance.
 - b. Discuss PLC, OI and SCADA format, programming and setup requirements to ensure that parties involved have a clear understanding of the Contract requirements. This discussion is to cover graphic text display menu system, programming format, etc.
 - c. System Supplier to provide schedule for Preliminary Design Review and Critical Design Review.
 - d. Meeting shall occur 6 weeks prior to factory test.
 - 2. Meet with the Owner for a 4-hour PLC, OI and SCADA Critical Design Review meeting at the Owner's facility prior to start of any factory test for each process area.
 - a. Ensure that the Contractor Project Manager, System Supplier Engineer, System Supplier PLC software programmer, and Engineer and Owner are in attendance.
 - b. Provide preliminary PLC Software Operations and Maintenance Manual.
 - c. System Supplier to demonstrate the complete PLC setup. All station display and setpoint parameters will be checked for completeness by bringing PLC fully programmed & setup to the meeting.

- d. System Supplier to assign action items with required completion date. Contractor to submit report of completed action items to the Owner on or before designated date.
 - e. Meeting shall occur two weeks prior to factory test.
- 3. The Contractor shall include in his bid price an additional 20 hours of PLC, OI and SCADA, and other program changes to be designated during testing and start-up by the Owner. Programming changes made during factory testing shall not be deducted from these hours unless agreed upon by Engineer. Field program changes shall be made by original programmer within five (5) working days after notification in writing by Engineer. Failure of programmer to respond and make requested program changes within these five (5) working days will result in Owner hiring another programmer and backcharging the Contractor \$160.00 for each hour of the other programmer's time plus travel expenses. All programming configuration changes shall be performed by the original programmer and shall be made as directed by the Engineer in writing. A weekly report shall be prepared by System Supplier listing extra hour utilized, dates when work was done, description of work performed, and remaining number of extra hours. None of the hours shall be used for documentation, paperwork, travel, overhead, construction management, etc. that are not related to programming changes since this is included in the hourly rate without written approval from Engineer. Hours not used shall be applied to Service Contract between System Supplier and Owner to be utilized during the warranty period as requested by Owner. Hours not used shall be applied to Service Contract between System Supplier and Owner to be utilized during the warranty period as requested by Owner. All hours not used shall be allocated for additional program changes as directed by Owner during the one year warranty period.
- 4. No passwords shall be enabled on software or hardware developed for this project. All electronic disk copies provided to Owner shall not have any password protection enabled on them or the software. Software submitted with password protection will be removed by Owner and the Contractor will be back-charged for the cost thereof.

1.08 SUPERVISION

- A. The General Contractor shall schedule all activities, manage all technical aspects of the project, coordinate submittals and drawings, and attend all project meetings associated with this Division.
- B. The General Contractor shall supervise all work in this Division, including the electrical system general construction work, from the beginning to completion and final acceptance.

- C. The General Contractor shall supervise and coordinate all work in this Division to insure each phase of the project, submittal, delivery, installation, and acceptance testing, etc. is completed within the allowable scheduled time frames.
- D. The General Contractor shall be responsible for obtaining, preparing, completing, and furnishing all paper work for this Division; which shall include transmittals, submittals, forms, documents, manuals, instructions, and procedures.

1.09 INSPECTIONS

- A. All work or materials covered by the Contract documents shall be subject to inspection at any and all times by the Owner. If any material does not conform to the Contract documents, or does not have a favorably reviewed submittal status; then the Contractor shall, within three days after being notified by the Owner, remove said material from the premises; and if said material has been installed, the entire expense of removing and replacing same, including any cutting and patching that may be necessary, shall be borne by the Contractor.
- B. The Contractor shall give the Owner 10 working days' notice of the dates and time for inspection. Date of inspection shall be as agreed upon by both the Contractor and Owner.
- C. Work shall not be closed in or covered over before inspection and approval by the Owner Construction Manager. All costs associated with uncovering and making repairs where non-inspected work has been performed shall be borne by the Contractor.
- D. The Contractor shall cooperate with the Engineer and provide assistance at all times for the inspection of the electrical system under this Contract. The Contractor shall remove covers, provide access, operate equipment, and perform other reasonable work that, in the opinion of the Engineer, will be necessary to determine the quality and adequacy of the work.
- E. Before request for final inspection is made, the Contractor shall submit to the Owner in writing, a statement that the Contractor has made his own thorough inspection of the entire project enumerating punch list items not complete and that the installation and testing is complete and in conformance with the requirements of this Division.
- F. The Owner may arrange for a facility inspection by Cal-OSHA Consultation Service at any time. The Contractor shall make the necessary corrections to bring all work in conformance with Cal-OSHA requirements, all at no additional cost to the Owner.
- G. Contractor will be Responsible for any Additional Cost for Overtime, Weekend Overtime or Differential Time, Expenses for Inspection of Defective Work that has to be re-inspected.

1.10 JOB CONDITIONS

- A. The Contractor shall make all arrangements and pay the costs thereof for temporary services required during construction of the project, such as temporary electrical power and telephone service. Upon completion of the project, remove all temporary services, equipment, material and wiring from the site as the property of the Contractor.
- B. The Contractor shall provide adequate protection for all equipment and materials during shipment, storage and construction. Equipment and materials shall be completely covered with two layers of plastic and set on cribbing six inches above grade so that they are protected from weather, wind, dust, water, or construction operations. Equipment shall not be stored outdoors without the approval of the Engineer. Where equipment is stored or installed in moist areas, such as unheated buildings, etc., provide an acceptable means to prevent moisture damage, such as a uniformly distributed heat source to prevent condensation.
- C. The normal outdoor, not in direct sunlight, ambient temperature range of the job site will vary between 0 to 110 degrees Fahrenheit. All equipment shall be rated to operate in these temperature ranges or provisions for adequate heating and cooling shall be installed, at no additional cost to Owner.
- D. The jobsite is prone to vandalism and theft. Contractor shall be responsible for securing all materials and equipment against theft and vandalism for the duration of the project.
- E. Contractor & Subcontractors shall utilize temporary services during construction of the project. No Contractors shall utilize Wastewater Treatment Plant building power, receptacles, etc. during construction.

1.11 SUBMITTAL AND DRAWING REQUIREMENTS

- A. Hard copy Electrical submittals shall be submitted for favorable review by the Engineer. They shall be complete giving all details of connections, wiring, instruments, enclosures, materials and dimensions. Standard sales literature will not be acceptable.
- B. Electrical submittals shall be submitted for favorable review by the Engineer per this subsection. They shall be complete giving all details of connections, wiring, instruments, enclosures, materials and dimensions. Standard sales literature will not be acceptable.
- C. A copy of the appropriate Division Specification Sections, with addendum updates included and with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements.
 - 1. Checkmarks (✓) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated and, therefore,

requested by the Contractor, each deviation shall be underlined and denoted by a unique number in the margin to the right of the identified paragraph. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the Specifications.

2. The submittal shall be accompanied by a detailed, written justification for each numbered item explaining variance or non-compliance with specifications.
 3. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no review.
- D. The electrical submittals shall include but not be limited to data sheets and drawings for each product together with the technical bulletin or brochure. No FAX copies of documents are allowed. The electrical submittals shall include:
1. Product (item) name used herein and on the Contract Drawings.
 2. The manufacturer's model or other designation.
 3. Tag name/number per the drawings or schedules.
 4. Index Binder Tab Dividers.
 5. Detailed electrical one line, elementary and control diagrams showing all wiring requirements for each system.
 6. Complete documentation with full description of operation.
 7. Complete catalog cuts with full description of equipment. General sales literature will not be acceptable. The part or model number with options to be provided shall be clearly identified. Where more than one item or catalog number appears on a catalog cut, the specific item(s) or catalog numbers(s) proposed shall be clearly identified.
 8. Location of assembly at which it is installed.
 9. Input-output characteristics.
 10. Range, size, and graduations as required.
 11. Physical size with dimensions and mounting details.
 12. Enclosure fabrication and color.
 13. Enclosure layout and elevation drawings to scale.
 14. Quantity and quality requirements for electric power, air, and/or water supply.
 15. Materials of construction of components.
 16. Nameplate schedule.

17. Failure to provide submittals with heavy duty permanent plastic labeled index tabs may be grounds for immediate rejection without review.
 18. A complete Bill of Materials list shall be provided at the inside of the front cover.
 - a. The Contractor shall provide Bill of Material formatted as shown in Appendix "A." A separate set of Material Listing forms shall be provided for each MCC bucket, control panel and another listing all field equipment.
 - b. Generic names or part numbers used by a distributor or Systems House are not acceptable; originating manufacturer's name and part number shall be listed.
 19. A separate instrument data sheet shall be provided for each instrument per ISA S20 standards or approved equal. Provide an index with proper identification and cross-referencing of each data sheet. Clearly identify calibration ranges for all instruments.
 20. Submit CD disk copies of all submitted drawing in AutoCAD format.
 21. For each resubmittal, provide a copy of submittal comments and a separate letter, on Company letterhead, identifying how each submittal comment has been addressed in the resubmittal.
- E. All drawings shall be drawn using AutoCAD, drawn in a professional manner and submitted on 11" x 17" sheets. Shop drawings shall be provided with minimum drafting details as illustrated on the Contract "electrical" series drawings. Diagrams shall carry a uniform and coordinated set of wire colors, wire numbers, and terminal block numbers. The shop drawings shall include:
1. Electrical one-line diagrams detailing all devices associated with the power distribution system. The following applicable information or data shall be shown on the one-line diagram: location, size and amperage rating of bus; size and amperage rating of wire or cable; breaker ratings, number of poles, and frame sizes; standby generator; automatic transfer switch, utility metering, voltage, amperage, number of wires and phases; fault interrupt ratings; ground size and connections; neutral size and connections; power fail and other protective devices; fuse size and type; distribution transformer; panelboard; starters; contactor size and overload range; motor full load amperage of submitted motor and horsepower; rating for miscellaneous loads; etc. Submit a list for each piece of equipment containing the motor voltage, phase and full load amps with one-lines for verification of accuracy of submitted one line drawings.
 2. Elementary diagrams shall be provided for all relay logic, power supplies, PLC I/O and other wiring. All elementary diagrams shall be drawn in EMP/EGP format and standards similar to those shown on the E-series elementary diagrams showing ladder rung numbers and coil and contact cross referencing numbers.

3. Enclosure and Elevation layout diagrams; show all front panel and backpan devices drawn to scale. Show fabrication methods and details; including material of construction, paint color, support and latching mechanisms, fans and ventilation system, and conduit entrance areas.
4. Analog and digital I/O wiring diagrams showing the wiring requirements for each instrument loop. Graphic symbols shall conform with ISA S5.4 drawing standards. A loop diagram shall be furnished for each analog and digital I/O process and all PLC I/O cards. Loop diagrams shall include the following as a minimum:
 - a. The loop diagram shall be drawn with sufficient detail to express control philosophy. The diagram shall show all components and accessories of the instrument loop, highlighting special safety and other requirements. These diagrams shall be arranged to emphasize device elements and their functions as an aid to understanding the operation of a system and for maintaining or troubleshooting that system.
 - b. A separate drawing shall be prepared for each analog and digital card. Each card shall be arranged on the diagram in the same order as the physical arrangement of the card terminations. All termination points on the diagram shall be shown with the actual equipment identification, device and relay terminal number or letter, and I/O point P&ID English descriptor and tag name. A separate drawing shall be prepared for each card.
 - c. Energy sources - electrical power, air supply, pneumatic and hydraulic fluid supply, designating voltage, current, pressure, etc. shall be shown in detail on the diagram. Input and output signals (e.g., 1-5 VDC, 4-20 mA DC, 3-15 psig, etc.), power and instrument supplies to devices (e.g. 120 VAC, 24 VDC, 80 psig, etc.) shall be shown.
 - d. Engineering units shall be shown on the diagram. Each wire label, equipment identification terminal number or letter and color code shall be shown. Signal and DC polarities shall be shown.
 - e. All spare wires, cables and termination points shall be shown. All jumpers, grounding, shielding, power supply details shall be shown.
 - f. Example format of loop diagrams are shown on Contract "I" Series Drawings or may be obtained from the Engineer.
5. Submit drawings of all nameplates and tags, as specified herein, to be used on project. The Engineer has the right to adjust nameplate engraving titles during submittals at no additional cost to the Owner. Submittal to include the following:
 - a. Dimensions of nameplate.
 - b. Exact lettering and font for each nameplate.
 - c. Color of nameplate.

- d. Color of lettering.
 - e. Materials of construction.
 - f. Method and materials for attachment.
 - g. Drawing showing location of nameplate on each panel.
- F. Each submittal shall be bound in a three ring binder, which is sized such that when all material is inserted, the binder is not over 3/4 full. Binder construction shall allow easy removal of any page without complete manual disassembly; spiral ring type binders are not acceptable.
- 1. Each binder shall be appropriately labeled on the outside spine & front cover with the project name, contract number, equipment supplier's name, specification section(s), and major material contained therein.
 - 2. An index shall be provided at the inside of the front cover. This index shall itemize the contents of each tab and sub tab section. Also, list the project name, contract number and equipment supplier's name, address, phone number, and contact person on the index page. Index dividers (tabs) shall be provided to separate each section.
 - 3. All copies shall be clear and legible. Data sheets shall be provided for each instrument, with an index and proper identification and cross-referencing.
 - 4. Exceptions to the Contract specifications or drawings shall be clearly defined by the equipment supplier.
 - a. Data shall contain sufficient details so a proper evaluation may be made by the Engineer. Contractor shall provide separate letter (located in the front of the submittal) detailing specific exceptions to the Contract Specifications or Drawings.
 - b. Exceptions that are noted in the marked-up Drawings or Specifications, but not listed on the Exceptions/Clarifications letter, will be considered as non-responsive and not accepted as changes to the Contract Documents.
 - 5. Request for information (RFIs) shall not be included in submittals. RFIs shall be submitted separately in its individual submittal number.
 - 6. Resubmittals shall be provided with a copy of the previous submittal comments and a separate letter, on company letterhead, identifying how each submittal comment has been addressed in the resubmittal.
 - 7. Failure to provide submittals with heavy duty permanent plastic labeled index tabs may be grounds for immediate rejection without review.
- G. Field equipment shop documents, panel equipment shop documents, drawings, and bill of materials shall be grouped under separate tabs. Catalog cuts shall be ordered in the same sequence as their corresponding Contract specification subsection.

- H. Drawings shall be submitted in a separate hole-punched binder that covers the entire 11" X 17" length of the Drawing:
1. Shop Drawings with less than 20 sheets total in the submittal, may be provided in an 11½-inch by 17½-inch reinforced folder.
 2. All Shop Drawings of 20 sheets or more shall be provided in separate heavy duty three-ring binder to allow drawings to be easily removed. Binder shall be Cardinal D-Ring Easy Open Ledger Binder with locking D-Rings or approved equal.
 3. Failure to provide drawing submittal in correct binder format may be grounds for immediate rejection without review.
 4. Each drawing title block shall contain the English description name for drawing contents (i.e. Lift Pump No. 1 Drawing) and drawing number. All pages and drawings in the submittal shall be numbered sequentially (with no number skipped) in lower right hand corner.
 5. Drawings that are "C" or "D" size shall be folded, with the title block visible and placed in reinforced clear plastic pockets.
- I. Catalog cuts and drawings shall be submitted for all devices and components in the electrical system.
- J. The Supplier shall coordinate submittals with the work so that project will not be delayed. This coordination shall include scheduling the different categories of submittals, so that one will not be delayed for lack of coordination with another.
- K. No submittal documents shall be labeled as proprietary. Labeling documents as proprietary will be sufficient cause for rejection of entire submittal. The Owner reserves the right to copy or duplicate any and all portions of the documents provided for the project including copyrighted documents as desired.
- L. No material or equipment shall be allowed at the job site until the submittal for such items has been favorably reviewed by the Engineer and marked "No Exceptions Taken" or "Make Corrections Noted."
- M. Identify all submittals by submittal number on letter of transmittal. Submittals shall be numbered consecutively and resubmittals shall have a letter suffix. For example:
1. 1st submittal: 1.
 2. 1st resubmittal: 1A.
 3. 2nd resubmittal: 1B, etc.
- N. The equipment specifications have prepared on the basis of the equipment first named in the Specifications. The Supplier shall note that the second named equipment, if given, is considered acceptable and equal equipment,

but in some cases additional design, options, or modifications may be required, at no additional cost, to meet Specifications.

- O. The decision of the Engineer governs what is acceptable as a substitution. If the Engineer considers it necessary, tests to determine equality of the proposed substitution shall be made, at the Supplier's expense, by an unbiased laboratory satisfactory to the Engineer.
- P. Electrical submittals shall be complete giving all details of connections, wiring, instruments, enclosures, materials and dimensions. Standard sales literature will not be acceptable.

1.12 CHANGE ORDER PRICING

- A. All change order pricing by Contractor or System Integrator shall be broken out into the following minimum categories:
 - 1. Labor per hour, listed per discipline, i.e. Engineer, Drafter, Estimator, Programmer, Secretarial, etc.
 - 2. Materials and equipment itemized per component and quantity.
 - 3. Rentals, travel, per diem, etc.
 - 4. Tax.
 - 5. Shipping.
 - 6. Overhead and profit.
- B. Lump sum change order pricing is not acceptable.
- C. If Contractor or System Integrator refuses to provide a change order with broken out pricing, the Engineer reserves the right to obtain independent estimates from other Contractors or System Integrators. The Contractor or System Integrator who refused to provide the change order with broken out pricing will be charged for the preparation of the independent estimates.

PART 2 - MATERIALS

2.01 QUALITY

- A. It is the intent of the Contract specifications and drawings to secure the highest quality in all materials and equipment in order to facilitate operation and maintenance of the facility. All equipment and materials shall be new and the products of reputable suppliers having adequate experience in the manufacture of these particular items. For uniformity, only one manufacturer will be accepted for each type of product.
- B. All equipment shall be designed for the service intended and shall be of rugged construction, of ample strength for all stresses that may occur during fabrication, transportation, erection, and continuous or intermittent operation. All equipment shall be adequately stayed and braced and anchored and shall be installed in a neat and workmanlike manner. Appearance and safety, as well as utility shall be given consideration in the design of details. All components and devices installed shall be standard items of industrial grade, unless otherwise noted, and shall be of sturdy and durable construction suitable for long, trouble free service. Light duty, fragile and competitive grade devices of doubtful durability shall not be used.
- C. Products that are specified by manufacturer, trade name or catalog number established a standard of quality and do not prohibit the use of equal products of other manufacturers provided they are favorably reviewed by the Engineer prior to installation.
- D. Underwriters Laboratories (UL) listing is required for all substituted equipment when such a listing is available for the first named equipment.
- E. When required by the Contract specifications or requested by the Engineer, the Contractor shall submit equipment or material samples for test or evaluation. The samples shall be furnished with information as to their source and prepared in such quantities and sizes as may be required for proper examination and tests, with all freight and charges prepaid. All samples shall be submitted before shipment of the equipment or material to the job site and in ample time to permit the making of proper tests, analyses, examinations, rejections, and resubmissions before incorporated into the work.
- F. All equipment shall be designed and constructed so that in the event of a power interruption, the equipment specified hereunder shall resume normal operation without manual resetting or operator interaction when power is restored.
- G. Signal transmission from remote or field electric and electronic devices shall be 4-20 mA, sourced by a 24 VDC loop supply from the panel that is to receive the signal. Nonstandard transmission methods such as impulse duration, pulse rate, and voltage regulated will not be permitted except where specifically noted.

- H. Outputs of equipment that are not of the standard signals as outlined, shall have the output immediately raised and/or converted to compatible standard signals for remote transmission.
- I. It is the System Supplier's responsibility to visit jobsite to collect and document existing conditions and equipment device part numbers in order for all similar called out new equipment to match existing.

2.02 NAMEPLATES AND TAGS

- A. Equipment exterior nameplates - Nameplate material shall be rigid laminated black phenolic with beveled edges and white lettering; except for caution, warning, and danger nameplates the color shall be red with white lettering. The size of the nameplate shall be as shown on the drawings. No letters are allowed smaller than 3/16". Securely fasten nameplates in place using two stainless steel screws if the nameplate is not an integral part of the device. Epoxy cement or glued on nameplates will not be acceptable.
 - 1. For each major piece of electrical equipment provide a manufacturer's nameplate showing the Contract specified name and number designation, the manufacturer's name, model designation, part number, serial number, and pertinent ratings such as voltage, amperage, # of phases, range, calibration, etc.
 - 2. For each device with a specific identity (pushbutton, indicator, instrument, etc.) mounted on the exterior or deadfront of a piece of equipment provide a nameplate with the inscription as shown in the Contract documents. Where no inscription is indicated in the Contract documents, furnish nameplates with an appropriate inscription providing the name and number of device.
 - 3. For all receptacles and switches, provide a faceplate engraved or stamped with the panelboard and circuit number it is fed from. Also, include on faceplate or on a separate nameplate for each light switch identification use such as "OUTSIDE BUILDING LIGHTS," "PERIMETER LIGHTS," "MCC ROOM," etc.
 - 4. All field instruments and devices shall be labeled with designation shown on P&ID diagrams.
 - 5. All transformers and panelboards shall have nameplates with 1/2" high letters and be engraved with designations as shown on one-line Drawings.
 - 6. All safety and disconnect switches shall have nameplates with 1/2" high letters and be engraved with designations as shown on one-line drawings.
 - 7. Underground Pull Box and Vault Cover Identification: Engrave or bead weld pull box covers with minimum 1/4" thickness and 1/2" letters and Covers shall be engraved with designations as shown on Contract drawings or as directed by Owner.

8. Aboveground Pull Box Cover Identification: 316 stainless steel screws attached stamped 316 stainless steel plate nameplates with 1/2" letters and be engraved with designations as shown on Contract drawings or as directed by Owner.
 9. Provide engraved nameplate with 1/2" letters at service entrance equipment (red with white lettering) indicating type and location of standby generator per NEC 702.7 (A).
 10. Provide engraved nameplate with 1/1" letters at service entrance equipment per NEC 702.7(B)
 11. Per NEC 110.24 (A) Service equipment shall be legibly marked in field with the maximum available fault current. Field marking shall include date the fault current calculation was performed and be weather & UV rated. Service equipment shall not be hand labeled.
- B. Equipment Interior Nameplates - Nameplate material shall be clear plastic with black machine printed lettering as produced by a KROY or similar machine; except caution, warning, and danger nameplates shall have red lettering.
1. The size of the nameplate tape shall be no smaller than 2" in height with 3/8" lettering unless otherwise approved by the Engineer. Securely fasten nameplates in place on a clean surface using the adhesion of the tape. Add additional clear glue to hold the nameplate securely in place when necessary.
 2. For each device with a specific identity (relay, module, power supply, fuse, terminal block, etc.) mounted in the interior of a piece of equipment provide a nameplate with the inscription as shown in the Contract documents. Where no inscription is indicated in the Contract documents, furnish nameplates with an appropriate inscription providing the name and number of device used on the submittal drawings.
- C. Equipment Tags - When there is no space or it is impractical to attach an engraved phenolic nameplate with screws, as is the case with some field devices and instruments, the Contractor shall attach a tag to the equipment with the same inscriptions as specified above in paragraph A. The tag shall be made from stainless steel material and the size of the nameplate shall be no smaller than 3/8"h x 2"w with 3/16" machine printed or engraved lettering unless otherwise approved by the Engineer. The tag shall be attached to the equipment with stainless steel wire of the type normally used for this purpose. SST wire shall be crimp connected. Twisting ends together is not acceptable.
- D. Engrave or machine print the tags with inscriptions as approved by the Engineer in the nameplate submittal.
- E. Provide temporary labels for all instruments and devices immediately when installed. Temporary labels shall be provided with 1/2" letters minimum and labeled with P&ID tag number.

2.03 WIRE

- A. This section applies to all wires or conductors used internal for all electrical equipment or external for field wiring. All wires shall be properly fused or protected by a breaker at the amperage rating allowed by the NEC.
- B. Material - Wire shall be new, plainly marked with UL label, gauge, voltage, type of insulation, and manufacturer's name. All wire shall conform to the following:
1. Conductors shall be copper, with a minimum of 98% conductivity.
 2. Wire shall be Class B stranded.
 3. Insulation of all conductors and cables shall be rated 600 volt.
 4. Insulation type for conductors smaller than #6 AWG shall be moisture and heat resistant thermoplastic THWN, rated 90 °C in dry locations and 75 °C in wet locations, or approved equal. Conductors #6 AWG and larger shall be XHHW insulation rated 90 °C in dry locations and 75 °C in wet locations.
 5. Field wire minimum AWG sizes:
 - a. #12 for wires used for individual conductor circuits 100 volt and above.
 - b. #14 for wires used for individual conductor circuits below 100 volt.
 6. Nonfield or equipment wire minimum AWG sizes:
 - a. #14 for wires used for individual conductor circuits 100 volt and above.
 - b. #18 for wires used for individual conductor circuits below 100 volt.
 7. Instrument wiring:
 - a. General: Instrument cables shall have 600V rated insulation and 100% individual shielded twisted pair #16 conductors with drain wire. Single twisted shielded pair (T.S.PR.) cables shall be Belden, or approved equal.
- C. Color code - color code of all wire shall conform with the following table:

WIRES COLOR CODE TABLE

DESCRIPTION	PHASE/CODE LETTER	FIELD WIRE WIRE OR TAPE COLOR	NON-FIELD WIRE COLOR
480 V, 3 PHASE	A	BROWN	BROWN
	B	ORANGE	ORANGE
	C	YELLOW	YELLOW

DESCRIPTION	PHASE/CODE LETTER	FIELD WIRE WIRE OR TAPE COLOR	NON-FIELD WIRE COLOR
240 V or 208 V, 3P	A	BLACK	-
	B	RED (ORANGE if high leg)	-
	C	BLUE	-
240 / 120 V, 1 P	L1	BLACK	BLACK
	L2	RED	-
12V POSITIVE	12P	DARK BLUE	DARK BLUE
12V NEGATIVE	12N	BLACK/RED STRIPE	BLACK/RED STRIPE
24V POSITIVE	24P	PINK	PINK
24V NEGATIVE	24N	BLACK	BLACK
AC CONTROL		VIOLET	RED (YELLOW FOR FOREIGN CIRCUITS)
DC CONTROL		LIGHT BLUE	LIGHT BLUE
NEUTRAL	N	WHITE	WHITE
GROUND	G	GREEN	GREEN
SHIELDED PAIR	+	BLACK	BLACK
	-	WHITE	WHITE

1. High leg of open delta shall be colored orange per NEC 110.15.
2. The same color shall be connected to the same phase throughout the panel.
3. All wires shall be properly fused or protected by a breaker at the amperage rating allowed by the NEC.
4. Neutral used for AC Control shall be white.
5. Phase color insulation shall be provided for complete length of #8 wire or smaller; colored phase tape is not allowed on #8 and smaller wire.

D. Wire Marking:

1. Wire identification: All wire terminations including field interconnect as well as wiring interior MCC cubicles, switchboard, panels, equipment, junction panels and boxes shall be identified with machine printed labels. Hand lettered labels are not acceptable and shall be replaced at the Contractor's expense. The wire identification code for all field interconnect and panel interior wiring, shall be similar to the designations shown on the Contract example drawings.
2. Wire Labels: The labels shall be machine printed with indelible ink, heat shrink type capable of accepting a minimum of 23 machine printed characters per sleeve label by Brady "Bradysleeve" or equal. Labeling shall be neatly installed for visibility and shall be clearly legible. Each wire and conductor shall be labeled with wire label as shown on approved

loop, and elementary Drawings. Labels shall not be wrap-around or snap-on type.

3. Where there is insufficient space for labels on locally interconnected neutral wires such as jumpers between adjacent auxiliary relay coil neutral terminals, these labels may be omitted. "Locally" is defined as wires no longer than 8".
4. Wire labels for lighting and receptacles shall be installed and consist of the panelboard and circuit number (i.e., Panelboard "LP1", circuit breaker #3 would have wire label line "LP1-L3" and neutral "LP1-N3").
5. All spare wires shall be labeled with equipment number followed by SP1, SP2, etc. (i.e. P11001-SP1 for first spare wire).
6. All control and signal wiring terminations shall have the correct wire label applied prior to making connection.

E. SPECIAL PURPOSE WIRING

1. Manufacturer Supplied Cables (MNFR CBL): Cables and wiring for special systems shall be provided by the manufacturer with the equipment and installed per the manufacturer's recommendations.
2. Indoor CAT 6 communication cable meet the following requirements:
 - a. TIA/EIA-568-A Category 6 100 MHz specifications.
 - b. #24 AWG solid bare copper conductor, 4 twisted pairs.
 - c. Thermoplastic Dielectric type.
 - d. Shielded bulk cable.
 - e. PVC jacket.
 - f. Nominal Impedance: 100 ohms.
 - g. Nominal capacitance: 20 pf/ft maximum.
 - h. UL listed.
 - i. Non-plenum usage rated when routed in conduit.
 - j. Plenum usage rated when routed in plenum spaces.
3. Generator Lead Cables: Generator lead cable have very flexible Class K (30 awg) stranding with PVC insulation and jacket. Cable shall be rated for 600 volt, 90 deg C. and be oil and gas resistant. Cable shall be Carol Diesel Locomotive Cable or approved equal.

2.04 CONDUIT, RACEWAYS, AND WIREWAYS

- A. GENERAL - Conduit, raceways, and wireways, wiring methods, materials, installation shall meet all requirements of the NEC, be UL labeled for the application, and meet the minimum following specifications.

1. All wiring shall be installed in conduits, raceways, or wireways when interconnecting equipment and devices.
2. The Contractor shall use special conduit, raceways, wireways, construction methods, and materials as shown on the Contract drawings; which shall take precedence over any general methods and materials specified in this Section.
3. The minimum size conduit shall be $\frac{3}{4}$ -inch unless indicated otherwise on the Drawings or for special connections to equipment. Buried, encased, or conduits located in walls shall be 1-inch minimum.
4. Conduit stubs for future use shall be capped with coupling, nipple, plug and cap and each end identified with conduit labels.
5. Conduits to be abandoned that protrude above graded shall be cut flush and filled with grout
6. Conduits shall not be filled to more than 50% of their total cross – sectional area.
7. CONDUIT MARKING
 - a. All conduits and raceways listed in Conduit & Wire Routing Schedule shall have conduit tags at both ends of each conduit segment. This includes all conduits in pullboxes and vaults.
 - b. Tag material shall be aluminum or stainless steel with machine stamped lettering. The size of the tag shall be 2" diameter. No letters are allowed smaller than 7/16". The tag shall be attached to the conduit with 316 stainless steel wire of the type normally used for this purpose. SST wire must be crimp connected. Twisting ends together is not acceptable. Engrave the tags on both sides with the conduit number as listed in the conduit schedule on the Contract "E"-series Drawings. Labeling shall be neatly installed for visibility and shall be clearly legible.
 - c. Prior to encasement, concealment, backfilling of conduits, temporary conduit labels shall be provided at each end of conduit. Temporary conduit labels shall have $\frac{1}{2}$ -inch (minimum) lettering at all transition points. After encasement and concealment temporary conduit labels shall be placed at each exposed end.

B. GALVANIZED RIGID STEEL CONDUIT (GRS)

1. Rigid steel conduit, couplings, bends and nipples shall be in accordance with ANSI C80.1 and UL-6.
2. Hotdip galvanized inside and outside after fabrication and then coated with a zinc bichromate finish. Provide threaded type fittings, couplings, and connectors; set screw type and compression type are not acceptable.
3. Minimum trade size - three-quarters inch ($\frac{3}{4}$ ") unless otherwise shown on Contract Drawings.

4. Conduits entering enclosures shall be fitted with insulated grounding bushing; O-Z "HBLG", Appleton "GIB", or approved equal. All grounding bushings shall be tied to the grounding system with properly sized bonding conductors per the NEC code.
5. Galvanized rigid steel factory elbows for 90 degree transitions.
6. EMT or IMC is not considered an equivalent to GRS.
7. GRS conduit is allowed only when specifically called out in the "Conduit and Wire Routing Schedule."
8. Pipe straps for conduits larger than $\frac{3}{4}$ " shall be two hole pipe straps. $\frac{3}{4}$ " conduits may have GRS-PVC single hole pipe straps with clamp back spacer.

C. GALVANIZED RIGID STEEL CONDUIT - PVC COATED (GRS-PVC)

1. Standard weight, galvanized rigid steel conduit with a 40-mil thick polyvinylchloride coating bonded to both the outside and urethane interior coating. Conduit shall be hot-dip galvanized conforming to NEMA RN 1. GRS-PVC conduit and fittings to be Robroy Plasti-bond Red or approved equal.
2. Provide PVC coated galvanized rigid steel factory ells for 90 degree transitions.
3. Fittings and boxes shall be stainless steel or galvanized cast ferrous metal with a PVC 40 mils thick coating. Provide threaded-type fittings, couplings, and connectors; set-screw type and compression-type are not acceptable.
4. All junction boxes shall be galvanized with exterior surfaces PVC coated to 40 mils thickness, except where stainless steel boxes are called out.
5. Conduits entering enclosures shall be fitted with insulated grounding bushing; O-Z "HBLG", Appleton "GIB", or approved equal. All grounding bushings shall be tied to the grounding system with properly sized bonding conductors per the NEC code.
6. Support channel and pipe straps shall be PVC coated. Exposed metal/nuts, all-thread rod shall be 316 stainless steel.
7. PVC coating patching material shall be as provided by the manufacturer.
8. PVC coated Aluminum conduit is not acceptable.

D. PVC CONDUIT, (PVC-40)

1. Shall be high impact polyvinylchloride suitable for use underground, direct burial and for use with 90 C wires, and shall conform to UL 651. Shall be UL listed and labeled for "direct" burial.
2. A copper bonding conductor shall be pulled in each raceway and bonded to equipment at each end with approved lugs.

3. Each underground run shall be placed in a trench with a minimum of four (4) inch sand bed evenly compacted on all sides, top and bottom.
 4. Bends, elbows, and risers shall be made with galvanized rigid steel (GRS) conduit using threaded adapters. Bond each metallic portion to each other and to equipment connected at each end of conduit run.
 5. PVC fittings shall have solvent-weld-type conduit connections.
 6. PVC conduit shall be stored on a flat surface and shielded from the sun.
 7. PVC conduit shall not be used above grade.
 8. PVC-40 conduit shall not be used in place of PVC-80 conduit.
- E. LIQUID TIGHT FLEXIBLE METAL CONDUIT - (SEAL TIGHT)
1. Minimum trade size one-half inch (1/2").
 2. All flex conduits shall have water tight outer jackets.
 3. Connectors:
 - a. Non-NEMA 1 or 12 areas: PVC coated metallic with insulated bushings.
 - b. NEMA 1 or 12 areas: Metallic with insulated bushings.
 4. Flexible conduit lengths shall not be greater than 36 inches.
 5. Flexible metallic conduit shall not be considered as a ground conductor, install a separate wire for equipment bonding.
 6. Flexible conduit shall only be installed in exposed or accessible locations.
 7. Flexible conduits shall be used for conduit coupling to all vibrating and shifting equipment.

2.05 COMPONENTS

A. FUSES

1. Fuses used in circuits 200 VAC and above shall be time- delay type FNQ or approved equal, 13/32" x 1½", and have an interrupting rating of 10,000 AIC at 500 VAC. Fuse holders shall be of the barrier type and rated 600 VAC.
2. Fuses used in 120 VAC shall be time-delay type MDL or approved equal, 1/4" x 1¼", and have a rating of 250 VAC. Fuse-holders shall be of the terminal block type.
3. Fuses used in signal and 24 VDC circuits shall be fast acting type ABC or approved equal, ¼" x 1¼", and have an rating of 250 VAC. Fuse-holders shall be of the terminal block type.
4. Fuses shall be sized in conformance with the NEC.

B. SWITCHES AND PUSHBUTTONS

1. Switches (HS) and pushbuttons (HC) for general purpose applications shall be water and oil tight as defined by NEMA 4X, corrosion resistant as defined by NEMA ICS 6-110.58, U.L. listed, standard 30 mm diameter, with round plastic clamp ring. Switches shall be Allen-Bradley 800H, IDEC ITE, or equal.
2. Switches and pushbuttons shall have contacts rated 10 amperes continuous and 600 VAC. Contract blocks shall have IP2X finger-safe protection.
3. Manufacturer's standard size legend plates shall be provided and engraved to specify each switch and pushbutton function. The legend plate color shall be black.
4. Selector switch handles and pushbutton caps shall be black.
5. Selector switches for hand-off-auto (HOA) applications shall have the hand position to the left, off in center, and auto in the right position.
6. Lockout stop shall be a pushbutton with red cap and pad locking assembly for pushbutton.
7. Potentiometers shall be 10K ohm, single turn, finger safe.

C. RELAYS AND TIMERS

1. General: Relays and timers shall be provided with N.O. or N.C. contacts as shown on the Contract drawings. All spare contacts shown shall be provided. Contacts shall be rated 10 amps minimum at 120 VAC, 60 Hz unless otherwise stated. Supply power or coil voltage shall be 120 VAC unless shown otherwise on the Contract drawings. Relays and timers shall be designed for continuous duty. All relays shall be U.L. listed. The following is a summary of abbreviations associated with relays and timers:

CR	-	Control Relay
TR	-	Timing Relay
PFR	-	Power Fail Relay
TDOE	-	Time Delay On Energization
TDOD	-	Time Delay On De-Energization
ISR	-	Intrinsic Safe Relay

2. Control Power relays (CR) shall be plug-in type with indicating lights and clear see-through sealed or enclosed housing to exclude dust. Sockets for plug-in relays shall be standard industrial type octal 8 or 11 pin with barrier pressure screw terminals. Provide Schneider Electric/Magnecraft 750/782, IDEC Type RR, or approved equal. Two form-C contacts (minimum) shall be provided on each relay.
3. Time delay relays (TR) on energization or de-energization shall be solid state plug-in relays with a timer adjustable over the range 1 second to 3 minutes unless other ranges are indicated or required. Provide LED timer

energized indicator lamp. Sockets for plug-in timers shall be standard industrial type octal 8 or 11 pin with barriered pressure screw terminals. Time delay relays shall be IDEC RTE, SSAC TD, or approved equal.

4. The power fail relay (PFR) shall continuously monitor the three phases for power loss, low voltage, phase loss, and phase reversal. The power fail monitor shall have a drop-out voltage adjustment, an adjustable delay on make time delay (0.2 to 8.0 minutes) and a status indicating LED. Power fail relays shall be Diversified SLJ, Time Mark, or approved equal.
5. Intrinsic safe relay (ISR) shall be Warrick Series 17 series operating from 120VAC power or approved equal. ISR shall have Form "C" dry contacts rated to switch 120VAC. Sensitivity shall be adjustable. ISR shall be rated for Class 1, Division 2 applications.

D. INDICATING LIGHTS

1. Indicating Lights for general purpose applications shall be water and oil tight as defined by NEMA 4X, corrosion resistant as defined by NEMA ICS 6-110.58, U.L. listed, High intensity multi-chip LEDs, full voltage (unless shown otherwise), standard 30 mm diameter, with round plastic lens and miniature bayonet lamp base. Indication lights shall be Allen-Bradley 800H, IDEC ALD, or approved equal.
2. Manufacturer's standard size legend plates shall be provided and engraved to specify each light's function. The legend plate color shall be black.
3. Indicating lights designated "PTT" shall be provided with a push-to-test switch and wiring.
4. Indicating light type and color of lens shall be as shown on the Drawings or specified in the Contract documents.

E. CIRCUIT BREAKERS

1. Circuit breakers shall be of the indicating type, providing ON, OFF and TRIPPED positions of the operating handle. Circuit breakers shall be quick-make, quick-break, with a thermal-magnetic (TM) action or Motor Circuit Protectors (MCP) as shown on One-Line Diagrams. Circuit breakers shall be the bolted on type. The use of tandem or dual circuit breakers in a normal single-pole space to provide the number of poles or spaces specified are not acceptable. All multiple-pole circuit breakers shall be designed so that an overload on one pole automatically causes all poles to open. Circuit breakers and motor circuit protectors shall be manufactured by Eaton, G.E., ITE, or approved equal.
2. Each 480 volt or 240V circuit breaker shall have a minimum interrupting capacity of 35,000 amperes. Each 120 volt breaker shall be rated for a minimum 10,000 amperes interrupting capacity. Breakers shall be sized as shown on Drawings and as necessary for the supplied equipment.
3. Fused disconnects shall not be used in place of breakers.

4. All breakers shall be supplied with the correct sized copper only lugs for wire sizes as listed in "Conduit & Wire Routing Schedule". Provide larger frame breaker or lug adapters as necessary when connecting to the listed oversized wire.

F. TERMINAL BLOCKS

1. CONTROL PANEL TERMINAL BLOCKS

- a. Terminal blocks to be clamp type, 6mm spacing, and 600 volt, minimum rating of 30 amps, and mounted on DIN rail, Entrelec M4/6 colored, Weidemuller or approved equal. DIN rail shall be same type as used for the relays. Install an extra DIN rail on each type of terminal strip with 4 terminals for future additions.
- b. Provide terminal blocks with "follower" plates which compress the wires and have wire guide tangs for ease of maintenance. Terminal blocks which compress the wires with direct screw compression are unacceptable. All power, control and instrument wires entering and leaving a compartment shall terminate on terminal blocks with wire numbers on terminals and on both ends of the wires.
- c. Terminal Tags and Markers: Each terminal strip shall have a unique identifying alphanumeric code at one end (i.e.: TB1, TB2, etc.) and plastic marking strip running the entire length with a unique number for each terminal. On each terminal strip, terminal numbers shall be assigned starting with #1 at one end, incrementing in alphabetical order (i.e.: 1,2,3,4...). Numbers shall be assigned to all blocks except grounding blocks. Fuse blocks shall be assigned unique tag numbers such as FU1, FU2. No two fuses shall be assigned the same tag number.
- d. Plastic marking tabs shall be provided to label each terminal block. These marking tabs shall have a unique number/letter for each terminal which is identical to the "elementary" and "loop" diagram wire designation. Numbers on these marking strips shall be machine printed and 1/8 inch high minimum.
- e. 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.
- f. Provide a ground terminal or connection point for each grounding conductor.
- g. Provide a separate common or neutral terminal for every two (maximum) inputs and/or outputs.

2. Power Termination Blocks shall be rated for 600V main power connection. The power termination blocks shall be rated to accept Copper or Aluminum cable rated as shown on Contract one-line diagrams. The power termination block shall be capable of being mounted anywhere in a termination box. Each termination block shall be provided with lug shield to prevent contact with power connections. The power termination blocks shall be Connectron or approved equal.

G. SURGE PROTECTIVE DEVICE

1. The surge protective device (SPD) shall be rated for use on a 3 phase system at voltage shown on Contract One Line diagram. The transient current the surge protective device shall dissipate 80,000 amps minimum. The SPD shall also have a maximum transient energy (10x1000 μ sec waveform) per phase of 2,560 joules. Provide fuses feeding the SPD. Locate SPD so that the indicating lights are viewable without removing panels. The surge protective device shall be Eaton, Leviton 32000 series, or approved equal.

H. MOTOR STARTER

1. Motor starters (M) shall be magnetically operated, electrically held, full voltage, non-reversing, except as shown on the Drawings. NEMA sizes shall be as required for the horsepower of the supplied equipment. Contactors shall be UL rated and listed. Motor starters shall be Allen-Bradley Bulletin 509, GE, Square D, or approved equal.
2. Each motor starter shall have a 120 volt operating coil rated for continuous operation.
3. Auxiliary contacts shall be provided as shown on the Drawings or as required. Each motor starter shall be furnished with a minimum of two spare auxiliary contacts in excess from those shown to be used. Auxiliary contacts shall be convertible, in the field, from normally open to normally closed, or vice versa.
4. Starters shall have adjustable bi-metallic overload relays. Adjustable overload relays shall be adjustable for trip point and for automatic or manual reset. Each overload shall be ambient compensated with a visible trip indicator. Each overload shall be ambient compensated and shall trip on 600% of full load current in less than 6 seconds. Each overload relay shall have a test trip pushbutton built-in and an adjustable calibrated trip with indicating dial. Three-phase starters shall have 3 overload relays. Each overload relay shall have a normally closed holding contact and a normally open isolated contact for overload shutdown. Motor Overloads shall be Allen-Bradley or approved equal.

I. ELAPSED TIME METERS:

1. Elapsed time meters (ETM) for general use shall be non-resettable, with 0.0 to 99,999.9 hour readout, permanently lubricated synchronous motor drive, nominal 2-1/2" circular two-hole surface front panel mount housing,

screw terminals, and rated at 120 VAC, at 60 Hz. Elapsed time meters shall be Stemco-Engler Series, 710-0002, Yokogawa, or approved equal.

2.06 DEVICES

A. BOXES

1. Device boxes shall be cast or galvanized steel type with shape and size best suited for the particular application, rated for the location installed, and shall be supported directly to support structure by means of stainless steel screws, anchors, or bolts.
2. Box dimensions shall be in accordance with size, quantity of conductors, and conduit clearances per NEC 314 requirements.
3. Boxes exposed to the weather or in moist locations where GRS-PVC conduits are to be used shall be weatherproof (WP) PVC coated cast type with threaded hubs or stainless steel with watertight myers hubs.
4. Non-Weatherproof Boxes Surface boxes shall be cast ferrous, deep FD type.
5. Weatherproof Boxes PVC-coated cast ferrous boxes may be used in place of 316 stainless steel boxes, except where boxes contain devices on cover. Boxes shall be deep, FD type. Single gang boxes shall have cast hubs.

B. SWITCHES

1. General purpose switches shall be manufactured in accordance with UL 20. Switches shall be one pole rated, 20 amps, at 277 VAC. Bodies shall be of ivory phenolic compound supported by mounting strap having plaster ears. Switches shall have copper alloy contact arm with silver cadmium oxide contacts. Switches shall have slotted terminal screws and a separate green grounding screw. Furnish Hubbell 1221, Leviton, or approved equal.

C. RECEPTACLES

1. General purpose receptacles shall be duplex and rated 20 amps, 120 VAC, 2 pole, 3 wire grounding, NEMA 5-20R configuration, specification grade, and side wired to screw terminals. Face color shall be brown in industrial areas and white or ivory in finished areas. General purpose receptacles shall be Bryant, Hubbell, or approved equal.
2. GFI (ground fault circuit interrupting) receptacles shall be used for providing power to miscellaneous cord powered equipment. GFI receptacles shall be duplex, 20A, 120V, with "test" and "reset" buttons with shallow design for mounting and standard screw terminals for direct wiring. Receptacles shall be designed, manufactured, and tested to prevent nuisance tripping from voltage spikes, RFI, EMI, or electronic component failures. Chaining multiple receptacles from one GFI unit is not

acceptable. GFI receptacles shall be Arrow-Hart "specification grade", Leviton, or approved equal.

D. DEVICE PLATES AND COVERS

1. General purpose device plates and covers shall be anodized aluminum. Plates or covers shall be attached with stainless steel screws. Circuit breaker number and panelboard name shall be stamped on each cover.
2. PVC coated device boxes shall have PVC coated gasketed covers.
3. Weatherproof switch, outlet, and receptacle boxes shall be fitted with gasketed covers rated for wet locations in accordance with NEC 406.8.
4. Weatherproof switch, outlet, and receptacle boxes shall be fitted with cast aluminum gasketed cover rated for wet locations. Each receptacle access cover shall have a gasketed spring door to maintain the weatherproof integrity with plug inserted in accordance with NEC 406.8 for unattended locations. Final decision of type of access cover for specific location shall be per Engineer. Screws and hinge springs shall be 316 stainless steel. Receptacles located outside shall have tumbler key lock.
5. Weatherproof access covers shall be Hubbell, Crouse-Hinds, or TayMac Safety Outlet Enclosures, or approved equal.
6. Receptacle and light switch plates shall be stamped or engraved as specified herein.

2.07 CONTROL PANEL

- A. Control Panel located in a pedestal section shall consist of the PLC system, operator interface, power supply, Ethernet switch, and other devices for a complete and operational system.
 1. Processor Logic Controller (PLC) to be Allen-Bradley MicroLogix 1400 series with:
 - a. Processor 1766-L32BWAA with battery, built-in Ethernet port, 20 discrete inputs, 12 discrete relay outputs, 4 analog voltage inputs & 2 analog voltage outputs, and removable flash memory card loaded with PLC program at end of project as accepted.
 - b. All wiring from the PLC I/O terminals shall be wired to interface terminal blocks, including all spares, as shown on Contract drawings to match the I/O of the CDCR Representative's Standard PLC, Program Configuration and I/O wiring.
 - c. Connect OI to PLC utilizing Ethernet switch.
 2. Reuse existing cellular connection back to Central SCADA (AirLink LS300). Contractor shall make provision on backpan for future licensed frequency radio system with lightning arrestor. Modify existing system to transmit the following information between the sites and Central:

- a. Auto status of each pump
 - b. Run status of each pump
 - c. Pump Fail for each pump
 - d. Start/Stop setpoints
 - e. High and Low level setpoints and alarm status
 - f. Level
3. Operator Interface:
- a. Provide Operator Interface (OI) Automation Direct (C-More) 6" TFT Color Touchpanel system, or approved equal. OI to be panel mounted through cutout in new Control Panel door. Provide all cables and programming necessary for a complete and operable system.
 - b. Provide an operator interface that meets the following requirements:
 - 1) Touch screen operator interface with Ethernet Communication Port.
 - 2) Operator interface with 6" TFT color liquid crystal display with analog resistive NEMA 4X touch screen.
 - 3) Compatible with PLC.
 - 4) Operator terminal capable of setup using standard PC.
 - 5) Full OI programming software to be delivered to Owner for their use.
 - c. The following shall be provided on the OI display for all ladder logic program control strategies:
 - 1) Graphic screen displaying pump station main parameters in process flow format (similar to P&ID).
 - 2) Provide pump text status next to pump symbol (i.e. green pump – run, include text "RUN" next to pump to describe color coding)
 - 3) Provide Alarm symbol next to each analog value indicating if value is in alarm (i.e. "HI" in red flashing circle next to value, do not rely on slight color change to value text).
 - 4) Setup control parameter screen listing all setpoint registers.
 - 5) Alarm summary screens listing all alarms with Alarm History clear function.
 - 6) All values displayed with engineering units.
 - 7) Text accompanying any changes in color display (i.e. green – "RUN", red – "OFF", etc.).
 - 8) Pump runtime; daily, total and 24hr average and daily number of starts.

- 9) Analog values with the following resolution:
 - a) Level & level setpoints with 1/10s decimal resolution.
- 10) Provide motor control logic troubleshooting screen for each motor listed in control strategy displaying runs similar to ladder logic diagram for a motor to operate.
- 11) Display indicating a new alarm no matter which screen is currently displayed.
- 12) Jump button displayed on all screens to go to a menu screen listing jumps to all screens.
- 13) Jump button displayed on all screens to go to the last screen.
- d. Setup color convention to be used:
 - 1) Background colors
 - a) Window – Black.
 - b) Changeable variable points - Pale Yellow.
 - c) Non-Changeable variable points - Light Blue.
 - 2) Control Switch Colors
 - a) Hand - Red.
 - b) Off - Grey.
 - c) Auto - Green.
 - 3) Pump & Equipment Colors
 - a) Run - Green.
 - b) Off - Red.
 - c) Fail - Gold.
 - d) Ready/Available - White.
- 4. Miscellaneous Devices
 - a. Connection between Ethernet Port and Ethernet hub shall be made with Cat 5 patch cable. Patch cable shall be 4 pair stranded PVC cable with HI-FLEX conductors. Length shall be 5 feet minimum. Color of cable shall be red.
 - b. 6-port Ethernet hub shall be Moxa, N-Tron 500 series, or approved equal compatible with Allen-Bradley Ethernet communication.
 - c. Lights, switches, pushbuttons, terminal blocks etc. to match those specified herein.
 - d. RFI filters to be for power line radio frequency protection, CORCOM VK series or approved equal.

- e. Receptacle to be duplex and rated 20 amps, 120 VAC, 2 pole, 3 wire grounding, NEMA 5-20R configuration, specification grade, and side wired to screw terminals.
 - f. DC power supply to be linear type and rated per Contract drawings at 24VDC, Power One Linear series, HC24 or approved equal.
 - g. Intrusion bypass timer to be a 6 hour maximum spring wound timer with SPDT contacts and hold position, Intermatic model # FF, or approved equal.
 - h. Each isolator shall provide complete isolation of the 4-20 mA output signal from the input signal and isolator power supply. The 4-20 mA output signal shall be capable of driving a 600 ohm load. Accuracy shall be +/- 0.25% of span. The isolator shall be powered as shown on Contract Drawings. The isolators shall be as manufactured by Phoenix Contact, Action Instruments, or approved equal.
 - i. Provide metal data pocket within each enclosure to hold as-built drawings.
5. Uninterruptable Power Supply:
- a. The Uninterruptable Power Supply (UPS) to provide VA shown on Contract drawings (minimum) backup power upon power failure to the 24 VDC power supply, Operator Interface (OI), 120VAC powered instruments & displays, and the processor logic controller (PLC) and PLC I/O cards in the Control Panel for 2 hours (minimum).
 - b. The UPS to have status "UPS ON BATTERY" and "UPS TROUBLE LOW BATTERY/FAIL" dry contacts for monitoring by PLC. Install relays in order to switch 120VAC control circuits.
 - c. Mount UPS in control compartment and provide all necessary power wiring. Plug cords and receptacles shall be provided so that the UPS can be readily bypassed with power being obtained directly from the panelboard.
 - d. UPS to have temperature rating compatible with expected internal enclosure temperature. Provide enclosure with adequate ventilation fans (with removable metal filters) or AC unit to keep enclosure internal temperature within UPS temperature rating.
 - e. UPS to be Marathon VTWE series, American Power Conversion Smart-UPS with AP9810 U- I/O modules, or approved equal.

2.08 APPLICATIONS PROGRAM AND CONTROL STRATEGIES

- A. Provide applications programs in the PLC & OI to implement the control strategies. Note, "PLC" references the entire PLC, OI, communications module and SCADA system. The Contractor is responsible to provide an application program that meets the intent of the descriptions given along with

any additional implementations for a fully operational system at no additional cost to Owner.

- B. PLC Software Configuration: The Supplier shall provide the PLC completely configured and programmed for the monitoring and control of the system. The PLC shall be setup as defined herein. The PLC shall be ready to be placed in operation at the time of factory test. The programming, setup and configuration of the PLC shall be performed by the System Supplier. All programming shall be performed by an application programmer with prior experience on a minimum of 10 successful similar PLC projects within the past two years. Owner reserves the right to judge if the application programmer assigned to this project is adequate for the task. If the programming performed is deemed inadequate by Owner, then the Supplier shall provide a qualified application programmer to meet these requirements at no additional cost to the Owner and with no extension to Contract time.
- C. The setup details given for the PLC, Operator Interface (OI), communications conversion module and SCADA are intended as guidelines for the Supplier to use to configure the system. The setup details were prepared with the available information on the software package and may not be the best way to accomplish the task. The opposite logic of that shown, is implied that the programmer will include it in the ladder logic. Errors and omissions in these details shall be the System Supplier's responsibility to correct, at no additional cost to Owner. The System Supplier shall meet the intent of the setup specified, making modifications as necessary to provide an operational system, at no additional cost to the Owner.
- D. The PLC ladder logic applications program and the SCADA OI configuration shall meet the intent of the P&ID on I-Series Contract Drawings and the Control Strategies described herein. The following additional program functions shall be provided (minimum):
 - 1. Enable/disable and settable time delays for all alarms.
 - 2. Display of all analog values.
 - 3. High and Low alarms for all new analog values to match existing format.
 - 4. Scaling to engineering values of all variables:
 - a. Level in 1/100s Foot resolution.
 - 5. Transducer out-of-range fail alarms.
 - 6. All setpoints, enable/disable, time delays, registers and scaling shall be adjustable from Central SCADA, OI and PLC.
 - 7. Sequential start time delay between similar equipment and pumps.

8. Real Time and historical trends for all analog inputs and digital pump runs or like digital equipment.
 9. Add to Central overview graphic screens all new I/O data.
- E. Tagname and I/O point designations shall match those used on the existing SCADA graphic screens and listed in Control Strategies.
 - F. Disk copies of existing PLC programs will be supplied by the Owner to the Contractor during construction for Contractor to utilize for SCADA, OI & PLC programming format. All PLC programs and graphic additions shall match the existing SCADA system look and feel. SCADA graphic configuration shall be done by System Supplier on existing SCADA computer PC. Setpoints and timer values are to be entered by Contractor via OI. Contractor shall add and modify existing database, historical trends, and Screens to meet the intent of the P&IDs on I - Series Contract Drawings. Pump station shall be controllable from Central.

2.09 FIELD DEVICES

- A. Each level switch shall utilize a Polypropylene float which moves with liquid level to actuate a hermetically sealed (non-mercury) microswitch. The level switch shall have Form "C" contacts with a minimum electrical with switch rating of 16 Amp at 120VAC. The float switch cable shall be secured with 316 stainless steel straps. The level switch shall be MJK7030, or approved equal.
- B. Submersible level probes to be range shown in Instrument Index with minimum accuracy of $\pm 1\%$. Transmitter shall be provided with a 2.5" 316 sensing diaphragm with dual internal diaphragm. Transmitter shall be 4-20 mA output loop powered. Transmitter shall be 35°F to 125°F compensated. Provide hydrophobic filter on the air tube mounted inside the panel. The filter shall be same manufacturer as the submersible level transmitter. Contractor is responsible for determining final manufacturer cable length. Submersible level transmitter shall be Blue Ribbon Birdcage BC001, or approved equal.
- C. Each intrusion door switch shall have a wide gap magnetic sensor with S.P.D.T. contacts mounted in a rugged steel housing with a 3 foot stainless steel armored cable for wiring to a junction box. Intrusion door switches shall be Sentrol 2507-A or approved equal.

2.10 PANELBOARD TRANSFORMER

- A. The panelboard transformer shall be ventilated dry type. Voltage, phase and KVA ratings shall be as shown on the Contract One-line drawing. The transformer shall be as manufactured by G.E. Type QL, Westinghouse, Jefferson, or approved equal.
- B. The transformer shall have 115°C rise, insulation 220°C rise class H insulation system.
- C. Vibration isolators shall be installed between the transformer and its mounting surface to reduce case vibration and compensate for slight unevenness of the mount. They shall be sized for the appropriate loading at twice the fundamental frequency. The Transformer housing shall be securely fastened to the mounting surface to eliminate possible sound generation.
- D. The transformer shall be finished with two coats of heavy enamel to resist rust and corrosion.
- E. Transformers that require neutral grounding shall be grounded in accordance with NEC 250.26, 450.10 and any applicable local ordinances. Protection of the grounding attachments shall be per NEC 250.24.

2.11 ELECTRICAL ENCLOSURES AND BOXES

- A. Enclosures and boxes to be wall mounted, minimum 14 gauge, type 316 stainless steel with seams continuously welded & ground smooth, and fast access door latches. A copper ground bus shall be provided in the enclosure. Outer door shall have provisions for locking enclosure with standard padlock. Provide white backpan in box. Provide larger enclosure as required to accommodate the supplied equipment at no additional cost to the Owner.
- B. Provide metal data pocket within each enclosure and box to hold as-built drawings.
- C. Each ground bus shall be copper and UL recognized. Screw type fasteners shall be provided on all ground buses for connection of grounding conductors. Ground bus shall have a minimum of 10 taps, and be rated for copper conductors. Ground bus shall be an ILSCO D-167 Series, or approved equal.
- D. Provide accessories consisting of breaker to disconnect incoming power, heater, fan, louvers, and thermostats. Enclosure shall be Hoffman, Circle AW or approved equal.

2.12 UTILITY METERING

- A. Provide a dead-front type, utility metering cabinet as shown on one-line diagram drawing and elevation diagram drawing. Metering main shall include meter socket, factory installed breaker and test by-pass facility. Voltage and amperage ratings shall be as shown on one-line diagrams. Metering shall be rated for a minimum interrupting current shown on Contract Drawings.
- B. Wiring and terminal blocks within the cabinet shall be furnished as required. Control components mounted within the assembly, such as test blocks, power termination block, etc., shall be suitable marked for identification corresponding to appropriate designations on manufacturer's wiring diagrams.
- C. Provide Service Entrance UL Label and necessary applicable service entrance features per NEC, local codes, and PG&E requirements.
- D. Metering cabinet shall be NEMA 3R construction for underground utility service.
- E. Metering to be approved in writing by Power Utility prior to the start of fabrication. The Contractor shall be responsible for obtaining written Utility approval of the metering cabinet. A copy of this written Utility approval shall be submitted to the Owner prior to shipment of Metering to jobsite.
- F. The Contractor shall obtain the required inspections and permits. City will pay all fees for the new service.
- G. The utility metering cabinet shall be manufactured by Circle AW or approved equivalent.

2.13 AUTOMATIC TRANSFER SWITCH

- A. Provide true 3-phase double-throw 200A NEMA3R automatic transfer switch with inherently interlocked construction. The switch shall be mechanically interlocked to ensure only one of two possible positions, normal or emergency. Provide separate bypass-isolation switch and solid neutral. ATS shall be ASCO model 300 or approved equal.
- B. Generator Exercise Timer: Seven (7) day timer, adjustable in 15-minute increments provided for operator adjustment of day, time and run duration for exercising the generator under operating loads by activating the automatic transfer switch. This timer shall be field set by the Contractor with date and time as specified by Owner.
- C. Provide separate signal lights indicating when Pedestal is powered from Utility source and when Pedestal is powered from Generator source. Provide full voltage type lights with push-to-test feature, in oil-tight units with lenses. Nameplates shall be provided with each light to identify each light's function.
- D. A pushbutton shall be provided to simulate normal source failure. Provide nameplate as shown on Contract Drawing.

2.14 PULL BOXES

- A. Underground pull boxes, where shown or required by length of conduit runs, shall be prefabricated concrete type with the size shown on the Drawings or larger to allow for adequate pull area. Extension sections shall be provided as necessary to reach the depth of underground conduits. All boxes shall have galvanized steel hold down bolts and hardware. Boxes located in paved areas or other areas which vehicles may travel shall be H/20 loading rated and have diamond plate steel traffic covers. Steel covers or lids shall be galvanized. Pull box covers shall be bead welded labeled with pull box designation. All underground pull boxes shall have a 12-inch bedding of $\frac{3}{4}$ -inch nominal crushed rock. Pull boxes shall be Christy Concrete Products, Brooks, or approved equal.

2.15 GROUNDING SYSTEM

- A. Ground clamps shall be bolt-on type as manufactured by ILSCO type AGC, O-Z Gedney Type GRC, Burndy Type GAR or GP, or approved equal.
- B. Ground buses shall be provided in all electrical enclosures. Each ground bus shall be sized as shown on the Contract drawings or specified herein. The ground bus shall be adequately sized for the connection of all grounding conductors required per NEC. Screw type lugs shall be provided on all ground busses for connection of grounding conductors.
- C. Grounding conductors shall be sized as shown on the Plans or in accordance with NEC table 250.122, whichever is larger.
- D. Conduit grounding bushings shall be installed on all metallic conduits. Conduit grounding bushings shall be set screw locking type electra-galvanized malleable iron with insulation collar and shall be provided with a feed through compression lug for securing the ground bonding wire.
- E. Bonding wires shall be installed on all conduits with grounding bushings, expansion joints and for continuity of raceways transitions. Bonding wires shall be solid bare copper sized and installed per NEC 250.122. Bonding wires at endpoints shall be connected to enclosure ground bus or equipment grounding lug.
- F. Attachment of the grounding conductor to equipment or enclosures shall be by connectors specifically provided for grounding. Mounting, support, or bracing bolts shall not be used as an attachment point for ground conductors.
- G. All raceway systems, supports, enclosures, panels, motor frames, and equipment housings shall be permanently and effectively grounded.
- H. One side of the secondary on all transformers shall be grounded to the ground bus.

- I. The system neutral conductor and all equipment and devices required to be grounded by the National Electrical Code shall be grounded in a manner that satisfies the requirements of the National Code.
- J. The system neutral (grounded conductor) shall be connected to the system's grounding conductor at only a single point in the system. This connection shall be made by a removable bonding jumper sized in accordance with the applicable provisions of the National Electrical Code if the size is not shown on the Drawings. The grounding of the system neutral shall be in the enclosure that houses the service entrance main overcurrent protection.
- K. All receptacles shall have their grounding contact connected to a grounding conductor.
- L. Branch circuit grounding conductors for receptacles or other electrical loads shall be arranged such that the removal of a lighting fixture, receptacle, or other load does not interrupt the ground continuity to any other part of the circuit.
- M. Negative side of all VDC power supplies shall be grounded.

2.16 ANTENNA SYSTEM

A. Antenna

- 1. Each antenna system shall be furnished and installed complete and functional for the intended use. An antenna system shall include but not be limited to, antenna, antenna pole, mounting hardware, lightning arrestor, and coaxial cables with connectors.
- 2. Antenna system shall be meet the following specifications:
 - a. Antenna shall be suitable for use on the assigned radio frequency and shall have the gain required for reliable communications.
 - b. All mating connectors that are exposed to weather shall be wrapped with a sealing material designed to protect against water and dirt entry into the connectors.
 - c. Antenna shall be installed and supported as shown on the Contract Drawings. Support members shall have sufficient strength to withstand local wind conditions and shall be protected from sun exposure and corrosive chemical damage.
 - d. Support hardware such as clamps, orientation mounts, and offset brackets shall be steel protected with a hot dip galvanized finish or stainless steel. Clamps and mounts shall be heavy duty in order to transfer the full antenna load to the support tower or mast. Bolts and screws shall be stainless steel.
 - e. Antenna shall be compatible with Sierra Wireless Airlink LS300. Provide Weboost 50ohm directional antenna or approved equal.

B. Transmission Cable

1. Provide 50 Ohm, 1/2" weatherproof coaxial cable from lightning arrestor to antenna. The coax cable shall have a corrugated outer conductor of copper, copper-clad aluminum inner conductor with foam dielectric. The coax cable shall be jacketed for corrosive environment and ultra-violet exposure. The coax cable shall be superflexible, with a minimum bending radius of 1.5 inches. The cable shall be installed as one continuous length from the antenna to the flange mounted lightning arrestor. Use Times Microwave Systems LMR-600 1/2" coax cable, no equal.
2. Provide 1/2" foam dielectric "superflexible" coaxial cable. The cable shall be installed as one continuous length from the antenna "pigtail" to the in-line lightning arrestor. Use Andrew FSJ4-50B 1/2" superflexible coax cable.
3. A backpan mount antenna lightning "N" connector arrestor shall be furnished on the antenna coaxial transmission line. The lightning arrestor shall be grounded to the MCC ground bus with a #8 AWG or larger bonding wire. The lightning arrestor shall be a PolyPhaser IS-50NX-C2.
4. Provide miscellaneous hardware such as grounding kits, hanger kits, and feed through assemblies.
5. The cable shall be carefully installed to prevent damage to the jacket and routed with a minimum bending radius of 8 inches.
6. Provide connector weatherproofing kits for outdoor exposed connectors and grounding strap attachments. All mating connectors that are exposed to weather shall be wrapped with a sealing material designed to protect against water and dirt entry into the connectors.
7. Type "N" in-line connectors shall be utilized at the terminations and shall be protected from weather by a vapor-wrap application. Provide Type N connectors with weatherproof "O" ring seals, as recommended by the coaxial cable manufacturer.

PART 3 - EXECUTION

3.01 ELECTRICAL WORKMANSHIP

- A. All work in this Section shall conform to the codes and standards outlined herein.
- B. The Contractor shall employ personnel that are skilled and experienced in the installation and connection of all elements, equipment, devices, instruments, accessories, and assemblies. All installation labor shall be performed by qualified personnel who have had experience on similar projects. Provide first class workmanship for all installations.
- C. Ensure that all equipment and materials fit properly in their installations.
- D. Perform any required work to correct improper installations at no additional expense to the Owner.
- E. The Engineer reserves the right to halt any work that is found to be substandard or being installed by unqualified personnel.

3.02 ELECTRICAL CONSTRUCTION METHODS, GENERAL

- A. All wiring shall be neatly bundled and laced with plastic tie-wraps, anchored in place by screw attached retainer. Where space is available, such as in electrical cabinets, all wiring shall be run in slotted plastic wireways or channels with dust covers. Wireways or channels shall be sized such that the wire fill does not exceed 60%. Wires carrying 100 volts and above shall be physically separated from lower voltage wiring by using separate bundles or wireways with sufficient distance to minimize the introduction of noise, crossing only at 90 degree angles. Tie-wraps shall be T & B TY-RAP's or approved equal.
- B. All devices shall be permanently labeled and secured in accordance with subsections labeled "NAMEPLATES AND TAGS."
- C. All field wires and panel wires have wire markers as specified in the "WIRE" subsection.
- D. All components associated with a particular compartment's or enclosure's function shall be mounted in that compartment or enclosure.
- E. Spacing and clearance of components shall be in accordance with UL, and NEC standards.
- F. Wires shall not be spliced except where shown. Devices with pigtails, except lighting fixtures, shall be connected at terminal blocks. Equipment delivered

with spliced wires shall be rejected and the Contractor required to replace all such wiring, at no additional cost to the Owner.

G. No wires shall be spliced without prior approval by the Engineer.

H. Where splices are allowed or approved by the Engineer they shall conform with the following:

1. Splices of #10 and smaller, including fixture taps, shall be made with see-thru nylon self-insulated twist on wire joints; T & B "Piggys," Ideal "Wing Nut" or approved equal.
2. Splices of #8 and larger shall be hex key screw two way connectors, with built in lock washers; T & B "Locktite", O-Z type XW, or approved equal, insulated with 3M Scotch Super #88, Plymouth, or approved equal.
3. Splices in underground pullboxes shall be insulated and moisture sealed with 3M "Scotchcast" cast resin splice kits and shall have a date marking for shelf life. Do not use splice kits with a date marking for shelf life that has expired.
4. Wire splicing devices shall be sized according to manufacturer's recommendations.
5. Tape on splices shall not be allowed.
6. Splices for motor leads shall be made with T&B MSC series splice kit, or approved equal.

I. Tapes shall conform to the requirements of UL 510 and be rated: 105 degrees C, 600V, flame retardant, hot and cold weather resistant. Vinyl plastic electrical tape shall be 7 mil black. Phase tape shall be 7 mil vinyl plastic, color coded as specified. Electrical insulation putty shall be rubber-based, elastic putty in tape form. Varnished cambric shall not be used.

J. Connections to terminals shall be as follows:

1. Use connector or socket type terminals furnished with component.
2. Connections to binding post screw, stud or bolt use:
 - a. For #10 and smaller wire, T & B "Sta-Kon", Buchanan "Termend" or approved equal, self-insulated locking forked tongue lug.
 - b. For #8 to #4/0 wire, T & B "Locktite," Burndy QA or approved equal lug of shape best suited.

- 3. Use ratchet type crimping tool which does not release until proper crimp pressure has been applied.
- 4. Connections for all terminals shall be made with insulation stripped per manufacturer's instructions.
- K. Equipment shall be wired and piped by the manufacturer or supplier. Major field modifications or changes are not allowed without the written "change order" authority by the Engineer. When field changes are made, the components, materials, wiring, labeling, and construction methods shall be identical to that of the original supplied equipment. Contractor's cost to replace or rework the equipment to match original manufacturer or supplier methods shall be done at no additional cost to the Owner.
- L. Mating fittings, bulkhead fittings, plugs, lugs, connectors, etc. required to field interface to the equipment and panels shall be provided by the supplier when the equipment is delivered.
- M. All electrical and instrumentation factory as-built drawings associated with the equipment shall be provided with the equipment when it is delivered to the job site. Drawings for each piece of equipment shall be placed in clear plastic packets of sufficient strength that will not tear or stretch from drawing removal and insertion.

3.03 ELECTRICAL EQUIPMENT, GENERAL

- A. Panel cutouts for devices (i.e. indicating lights, switches) shall be cut, punched, or drilled and smoothly finished with rounded edges. Exposed metal from cutouts that are made after the final paint finish has been applied shall be touched up with a matching paint prior to installing device. Do not paint nameplates, labels, tags, switches, receptacles, conductors, etc.
- B. All doors shall be fully gasketed with nonshrinkable, water and flame resistant material.
- C. Bolts and screws for mounting devices on doors shall be as specified by the manufacturer; otherwise they shall have a flush head which blends into the device or door surface. No bolt or screw holding nuts shall be used on the external surface of the door.
- D. No fastening devices shall project through the outer surfaces of equipment.
- E. Each component within the equipment shall be securely mounted on an interior cubicle or backpan and arranged for easy servicing, such that all adjustments and component removal can be accomplished without removing or disturbing other components. Mounting bolts and screws shall be front located for easy access and removal without special tools. Access behind the sub panel or backpan shall not be required for removing any component.

- F. HARNESS: Where space is available, all wiring shall be run in slotted plastic wire ways or channels with dust covers. If space is not available for wireways, then all wiring shall be neatly bundled and laced with plastic tie-wraps, anchored in place by stainless steel screw attached retainer. Wire ways or channels shall be sized such that the wire fill does not exceed 60%. Tie-wraps shall be T&B TY-RAP or approved equal.
- G. HINGE LOOPS: Where wiring crosses hinged surfaces, provide a "U" shaped hinge loop protected by clear nylon spiral wrap. The hinge loop shall be of sufficient length to permit opening and closing the door without stressing any of the terminations or connections. Spiral wrap shall be Graybar T25N or approved equal.
- H. RETAINERS: Wire ways, retainers, and other devices shall be screw mounted with round-head 316 stainless steel screws or mechanically mounted by push-in or snap-in attachments. Glue or sticky back attachment of any type or style shall not be used. Retainers shall be T&B TC series or approved equal.
- I. ROUTING: Wires shall be routed in slotted plastic wire-ways with snap covers.
1. Wires carrying 120 VAC shall be separated as much as possible from other low voltage wires and signal cables, and shall be routed only in ducts for 120 VAC. If the power wiring has to cross the signal wiring, the crossing shall be as close to a right angle as possible.
 2. Ducts for 24 VDC wiring shall be used for all other wires and cables. Routing of 120 VAC in combined ducts is not allowed without prior written approval of the Owner.
 3. Wires and cable shall be routed along the shortest route between termination points, excepting routes which would result in routing 120 VAC and other wires and cables in the same duct. Wires and cables shall have sufficient length to allow slack and to avoid any strain or tension in the wire or cable.
 4. Wires and cables shall be placed in the ducts in a straight, neat and organized fashion and shall not be kinked, tangled or twisted together. Additional wire ducting shall be provided for use by the electrical subcontractor for routing field wires to their landing points in the each electrical and instrumentation panel.
 5. Wiring not routed in duct work shall be neatly bundled, treed, and laced with plastic ties. Wiring across door hinges shall be carefully made up and supported to avoid straining and chafing of the conductors or from putting any strain on their terminals.

- J. TERMINATIONS: Single wire and cable conductors shall be terminated according to the requirements of the terminal device. All terminations must be made at terminals or terminal blocks. Use of spring or buttsplice connectors is not allowed.
1. Provide 2" minimum separation between wireway and terminal blocks. Installation of wireways too close to terminal blocks will be required to be completely reworked to the satisfaction of the Owner.
 2. For captive screw pressure plate type terminals, the insulation shall be removed from the last 0.25 inches of the conductor. The conductors shall be inserted under the pressure plate to full length of the bare portion of the conductor and the pressure plate tightened without excess force. No more than two conductors shall be installed in a single terminal. All strands of the conductor shall be captured under the pressure plate.
 - a. Terminal blocks and same equipment type termination wiring shall have all wiring terminated with appropriate sized ferrules with insulation collars. Ferrule crimping (full ratcheting) tool with proper sized jigs shall be used per manufacturer's recommendations.
 3. For screw terminals, appropriately sized locking forked spade lugs shall be used. Lugs shall be crimp on type that forms gas tight connections. All crimping shall be done using a calibrated crimping tool made specifically for the lug type and size being crimped.
 4. On shielded cables, the drain wire shall be covered with insulating tubing along its full bare length between the cable jacket and the terminal lug or terminal pressure plate.
 5. For screwless terminals, wire shall be stripped back and inserted per the manufacturer's instructions. When stripping insulation from conductors, do not score or otherwise damage conductor.
 6. Heat shrink shall be placed on ends of shielded cable to cover foil.
 7. Additional condulets with terminal blocks shall be supplied for wire termination to devices with leads instead of terminals. (i.e. solenoid valves, level probe, etc.)
 8. Terminate all status, control, and analog I/O wiring on terminal blocks, including spares. Provide additional relay, DIN rails, terminal blocks and side panels as required.
- K. Minimum wire bending space at terminals and minimum width of wiring gutters shall comply with NEC Tables 312.6 (A) & (B).

- L. Future device and component mounting space shall be provided on the door, backpan, and subpanel where detailed on the Drawings. Where no detail is shown, provide a minimum of 25 percent usable future space.
- M. Doors shall swing freely a minimum of 90 degrees and close with proper alignment.

3.04 DELIVERY

- A. Contractor shall inspect each electrical and instrumentation item delivered to the jobsite.
- B. Contractor shall unpack each item for inspection within two (2) days of arrival.
- C. Complete written inventory shall be produced by Contractor and submitted to Owner within (2) days after arrival on jobsite for record keeping prior to any payment for the item.

3.05 DAMAGED PRODUCTS

- A. Damage products will not be accepted. All damaged products shall be replaced with new products at no additional cost to the Owner.

3.06 FASTENERS & LUGS

- A. Fasteners for securing equipment to walls, floors, and the like shall be 316 stainless steel. The fastener size shall match equipment mounting holes.
- B. Stainless steel anchor bolts, ½" minimum size, shall be installed for the Electrical Equipment in the front and back of each section at locations recommended by Electrical Equipment manufacturer.
- C. Concrete pad with stainless steel anchor bolts shall be provided for all electrical freestanding equipment.
- D. All wall mounted panels or enclosures shall be spaced out from wall by stainless steel unistrut or stainless steel spacers with minimum depth of 1/2".
- E. All wire & cable lugs shall be copper; aluminum or aluminum alloy lugs shall not be used. The Electrical Contractor shall supply all lugs to match the quantity & size of wire listed in the conduit & wire routing schedule.

3.07 INSTALLATION, GENERAL

- A. System:
 - 1. Install all products per manufacturer's recommendations and the Drawings.

2. Contract Drawings are intended to show the basic functional requirements of the electrical system and instrumentation system and do not relieve the Contractor from the responsibility to provide a complete and functioning system.
- B. Provide all necessary hardware, conduit, wiring, fittings, and devices to connect the electrical equipment provided under other Sections. The following shall be done by the Contractor at no additional cost to the Owner:
1. Provide additional devices, wiring, conduits, relays, signal converters, isolators, boosters, and other miscellaneous devices as required to complete interfaces of the electrical and instrumentation system.
 2. Changing normally open contacts to normally closed contacts or vice versa.
 3. Adding additional relays to provide more contacts as necessary.
 4. Installing additional terminal blocks to land wires.
- C. All programmable devices, shall be programmed, set-up and tested by the Contractor prior to startup at the Contractor system supplier facility. This includes OI, PLC, and instrumentation. Programming and set-up parameters shall be adjusted or changed as directed by the Owner or Engineer during start-up and throughout the warranty period, at no additional cost to the Owner. Coordinate with the Owner and setup all alarm, process, time delays and operation setpoints.
- D. Panels and Enclosures:
1. Install panels and enclosures at the location shown on the Plans or approved by the Engineer.
 2. Install level and plumb.
 3. Seal all enclosure openings to prevent entrance of insects and rodents.
 4. All conduits entering outdoor panels and enclosures shall use watertight hubs. These hubs shall be located on sides or bottom only. Top entry of outdoor panels or enclosures is not allowed unless specifically shown on plans.
 5. Seal around bottom edge of all pad mounted enclosures to prevent entrance of insects, rodents, dirt, debris, etc.
 6. Clearance about electrical equipment shall meet the minimum requirements of NEC 110.66.

7. Box supports shall be located and oriented as directed in field by Owner.
8. A ground bus shall be provided in each enclosure or cabinet. It shall have provisions for connecting a minimum of ten grounding conductors. Screw type lugs shall be provided for connection of grounding conductors. All grounding conductors shall be sized as shown on plans or in accordance with NEC Table 250.122, whichever is larger.
9. All panels and enclosures be delivered with as-built drawings in clear plastic packets within each panel and enclosure.
10. Provide larger motor termination boxes as required to accommodate conduit and wires.

E. Conduits and Ducts:

1. Care shall be exercised to avoid interference with the work of other trades. This work shall be planned and coordinated with the other trades to prevent such interference. Pipes shall have precedence over conduits for space requirements. Exposed conduits shall be neatly arranged with runs perpendicular or level and parallel to walls. Bends shall be concentric.
2. Install conduit free from dents and bruises.
3. All conduits shall be labeled on all ends; at junction boxes, pull boxes, enclosures, stub-outs, or other terminations.
4. A maximum of three equivalent 90 degree elbows are allowed in any continuous runs. Install pull boxes where required to limit bends in conduit runs to not more than 270 degrees or where pulling tension would exceed the maximum allowable for the cable.
5. Route all above grade outdoor conduits or conduits in rated areas parallel or perpendicular to structure lines and/or piping.
6. Conduits installed outdoor or in NEMA 4X rated areas above grade shall be braced in place with stainless steel Unistrut stanchions or PVC coated clamps with backplates.
7. Duct-taping conduits together is not acceptable. Conduits, installed into concrete pads, shall be installed with a minimum of 2" distance between conduits to allow installation of bushings.
8. Conduit entrances: Seal each conduit entrance from below grade into the Panels, and other electrical enclosures with plugging compound sealant to prevent the entrance of insects and rodents.

9. Special "Soft-Jaw" type pipe clamps shall be used to prevent damage to PVC-coated conduits while field threading, cutting to length, and coupling sections.
10. Conduits shall be painted to match the color of surface attached to as directed by Owner.
11. All spares shall be mandrel and have pull ropes installed.
12. Conduits shall be painted to match the color of surface attached to as directed by Owner.
13. All existing conduits that are reused:
 - a. Shall have a mandrel pulled through the entire conduit run to prove the length contains no blockages or obstructions. Mandrelling shall be witness by the Owner.
 - b. Install new conduit tags at all transition boxes and endpoints. Conduit & Wire Routing Schedule shall be updated as these modifications take place.

F. Conduit and Wire Routing Schedule:

1. Conduit material, wire size, and quantity listed in Schedule take precedence over Division 16 Specifications.
2. All of the entries for each line in the conduit schedule apply to each conduit when multiple quantity of conduits (quantity of which are indicated by number entered in conduit no. column in schedule) are listed in the schedule.
3. Wire sizes listed are in AWG or Kcmil and are copper conductors.
4. Extra wire was intentionally placed in the "Conduit & Wire Routing Schedule," which shall be labeled on both ends with a unique wire label. "Spare" to be on separate tag or included in wire and label.
5. Contractor to supply and install all conduits and wiring as shown on Utility Engineered Design drawings. Utility primary and secondary conduit and wiring shown in "Conduit and Wire Routing Schedule" is for bid purposes only.
6. All control and signal wiring terminations shall have the correct wire label applied prior to making connection.

7. Conduit entries listed as "GRS-PVC" in the Conduit & Wire Routing Schedule are to be "Galvanized Rigid Conduits with PVC coating" the entire length.
8. Vertical offsets and sloping of conduits are not detailed on plans; the Electrical Contractor shall include in his bid the price for the complete conduit run utilizing the civil & mechanical plans to measure vertical & slope distances.
9. Exposed conduits runs shall not be run directly on the ground. Secure conduits to stainless steel unistrut.

G. Excavation and Back Filling:

1. The Electrical Contractor shall provide the excavation for equipment foundations and trenches for conduits or buried cables.
2. Trenches for all underground utility lines shall be excavated to the required depths.
3. Repave any area that was paved prior to excavation. Backfill and surface all areas as shown on the Drawings or where not shown to the original condition that was present prior to the excavation.
4. Underground conduits outside of structures shall have a minimum cover of 24 inches except for utility conduits depth shall be as required by the governing utility requirements. Back filling shall be done only after conduits have been inspected.
5. Contractor shall uncover any uninspected covered conduit trenches, at no additional cost to Owner, to verify proper installation.
6. Excavation and back fill conduit trenches shall conform to the requirements of the Earthwork Section of these Specifications, unless modified on plans, and to other entities as required. Backfill shall consist of 3/4 inch class 2 aggregate base material, unless otherwise noted.
7. At all times during the installation of the electrical distribution system, the Contractor shall provide barricades, fences, guard rails, etc., to safeguard all personnel, including small children, from excavated trenches.

H. Wiring, Grounding, and Shielding - It is important to observe good grounding and shielding practices in the generally noisy environment in this application. The shield of shielded cables shall be terminated to ground at one end only (source end), the shield at the other end (receive end) shall be encased in an insulated material to isolate it from ground.

I. Cutting and Patching - The Contractor shall do all core drilling, cutting and patching required to install his work. Any cutting which may impair the structure shall require prior approval by the Engineer. Cutting and patching shall be done only by skilled labor of the respective trades. All surfaces shall be restored to their original condition after cutting and patching. Paint patched surfaces to match the original color.

J. Seals

1. Seal around all conduits, wires, and cables penetrating between walls, ceilings, and floors in all buildings with a fire stop material. Seal shall be made at both ends of the conduit with a fire-stop putty. Seal shall have a minimum two hour rating. Fire stop sealing shall be International Protective Coatings Flamesafe, or approved equal.
2. Seal around conduits entering outside to inside structures and around bottom of free standing enclosures to maintain watertight integrity of structure.
3. Place conduit seal inside each underground conduit riser into panels and enclosures to prevent entrance of insects and rodents.
4. Conduit entrances: Seal each conduit entrance from below grade into the panel and other electrical enclosures with plugging compound sealant to prevent the entrance of insects and rodents. Conduits between the enclosures shall be sealed with plugging compound sealant on each end. Plugging compound sealant shall be PRC-DeSoto (formerly Courtaulds) Aerospace Semco PR-868 or approved equal.

K. Cleaning and Touch up:

1. Prior to startup and at completion of the work prior to final acceptance, all parts of the installation, including all equipment, exposed conduit, devices, and fittings shall be cleaned and given touch up by Contractor, as follows:
 - a. Remove all grease and metal cuttings.
 - b. Any discoloration or other damage to parts of the building, the finish, or the furnishings, shall be repaired.
 - c. Thoroughly clean any of his exposed work requiring same.
 - d. Vacuum and clean the inside of all MCC and electrical and instrumentation enclosures prior to applying power and a second time immediately prior to the final acceptance inspection.
 - e. Clean all above and below ground pull boxes, junction boxes, and vaults from all foreign debris prior to final acceptance.

- f. Paint all scratched or blemished surfaces with the necessary coats of quick drying paint to match adjacent color, texture, and thickness. This shall include all prime painted electrical equipment, including enclosures, panels, poles, boxes, devices, etc.
- g. Remove all decals and lettering from both sides of support plates.
- h. Repair damage to factory finishes with repair products recommended by Manufacturer.
- i. Repair damage to PVC or paint finishes with matching touchup coating recommended by Manufacturer.

3.08 ELECTRICAL TESTING

A. GENERAL REQUIREMENTS

- 1. It is the intent of these tests to assure that all equipment is operational within industry and manufacturer's tolerances and is installed in accordance with design plans and specifications.
- 2. All equipment setup and assembled by the Contractor shall be in accordance with the design plans and Drawings and the manufacturer's recommendations and instructions and shall operate to the Engineer's satisfaction.
 - a. Follow all manufacturer's instructions for handling, receiving, installation, and pre-check requirements prior to energization.
 - b. After energization, follow manufacturer's instructions for programming, set-up and calibration of equipment.
 - c. The Contractor shall be responsible for, and shall correct by repair or replacement, at his own expense, equipment which, in the opinion of the Engineer, has been caused by faulty mechanical or electrical assembly by the Contractor.
 - d. Necessary tests to demonstrate that the electrical and mechanical operation of the equipment is satisfactory and meets the requirements of these Specifications shall be made by the Contractor at no additional cost to the Owner.
- 3. The testing shall not be started until the manufacturer has completed fabrication, wiring, and setup; performed satisfactory checks and adjustments; and can demonstrate the system is complete and operational.

4. The first Pre-Energization tests shall be performed to determine the suitability for energization and shall be completed with all power turned off and complete prior to the start of any of the Post-Energization Tests. The Electrical Contractor shall have qualified personnel on the job site for all Pre-Energization and Post-Energization tests.
5. All tests shall be witnessed by the Engineer and/or Owner personnel. The test forms shall be completed by the testing person for field checkout, testing, and calibration of all equipment and instruments.
 - a. All filled in test forms shall be given to the Engineer and/or Owner the day of the test. Fill in two sets of test forms if Contractor wants to keep a copy.
 - b. All tests shall be documented in writing by the supplier and signed by the Engineer as satisfactory completed. The supplier shall keep a detailed log of all tests that failed or did not meet specifications, including date of occurrence and correction.
 - c. Completed forms with proper signatures and dates shall be included and become a component of the Operations and Maintenance Manual for each of the respective systems.
6. The Contractor shall notify the Owner and the Engineer of the Supplier's readiness to begin all factory and field tests in writing (a minimum of ten working days prior to start), and shall schedule system checkout on dates agreed to by the Owner and the Engineer in order that the testing be scheduled and witnessed.
 - a. The Contractor shall have thoroughly checked the entire "System Setup" prior to notification of readiness to begin factory test and provide written statement that they have performed an internal factory test prior to the Witness Factory Test with the request for Schedule Test date.
7. The Contractor shall fill in & submit for approval the "Scheduled Test Request Form" located in Appendix "A" for each requested factory test, inspection, and field test.
8. The supplier shall submit for approval, the proposed factory & field testing sheets at least 2 weeks prior to the start of the tests. Each testing sheet shall have a title giving the type of test and entry spaces for the name of the person who performed the test, name of the person who witnessed the test, and the date. Tests performed without approved forms shall be retested at no additional cost to Owner.
9. Engineer reserves the right to postpone the factory test, at no additional cost to the Owner, until the submittal associated with the factory test has

been reviewed by the Engineer and marked "No Exceptions Taken" or "Make Corrections Noted." No extension of Contract time will be allowed.

10. Separate test procedures in separate binders shall be submitted for approval for the Factory and Field Tests. Testing shall not commence until the test procedures have been reviewed and approved by the Owner. Tests forms shall be similar to those shown on Appendix "A."
11. Testing shall not commence until the test procedures have been reviewed and approved by the Owner. Tests forms shall be similar to those shown on Appendix "A."

B. FAILURE TO MEET TEST

1. If the results of any of tests are unacceptable to the Engineer, the Contractor shall make corrections and perform the tests again until they are acceptable to the Engineer; these additional tests shall be done at no additional cost to the Owner.
2. Any system material or workmanship which is found defective on the basis of acceptance tests shall be reported to the Engineer. The Contractor shall replace the defective material or equipment and have tests repeated until test proves satisfactory to the Engineer without additional cost to the Owner.

C. SAFETY

1. Testing shall conform to the respective manufacturer's recommendations. All manufacturers' safety precautions shall be followed.
2. The procedures stated herein are guidelines for the intended tests, the Contractor shall be responsible to modify these tests to fit the particular application and ensure personnel safety. Absolutely no tests shall be performed that endanger personal safety.
3. The Contractor shall have two or more personnel present at all tests.
4. Two non-licensed portable radios are to be made available by the Contractor for the testing organization to conduct tests.
5. California Electrical Safety Orders (ESO) and Occupational Safety and Health Act (OSHA): The Contractor is cautioned that testing and equipment shall comply with ESO and OSHA as to safety, clearances, padlocks and barriers around electrical equipment energized during testing.
6. Field inspections and pre-energization tests shall be completed prior to applying power to equipment.

D. ELECTRICAL FACTORY TEST

1. The System supplier shall conduct a thorough and complete factory test by qualified factory-trained personnel witnessed by Owner per the criteria specified herein. Factory test shall be held within 150 miles of project location.
2. The "System set-up" for factory testing shall consist of, but is not limited to Pedestals, disconnect switches, OI, Control Panel, PLC, and any miscellaneous associated electrical equipment.
3. Original PLC/OI/SCADA programmer shall be present during the entire Factory Test for modifying or adjusting all PLC registers, SCADA application and setpoints to test the system. If original PLC/OI/SCADA programmer is not present during the Factory Test, the Factory Test will be immediately cancelled and the Contractor shall be responsible for paying for the Owner and Engineer to return for the factory testing.
4. Temporary wiring and equipment shall be setup during these tests to simulate the complete assembled system.
5. The length of the factory testing for the "System setup" shall be a minimum of two (2) working days (one day if Madrone is not built).
 - a. If in the opinion of the Owner or Engineer the factory testing is not completed at the end of the working day, the testing shall be extended, at no additional cost to the Owner or extension in Contract time.
 - b. The Contractor shall agree that the sum set forth hereafter is a reasonable amount to be charged as liquidated damages; and it is therefore agreed that the Contractor will pay the Owner the sum of one thousand, five hundred dollars (\$1500.00) in liquidated damages for each and every calendar day beyond the time prescribed above for the completion of factory testing for the System set-up. Liquidated damages will be assessed to the Contractor each and every day past the time allotted for factory testing.
6. All factory tests shall be conducted at the Supplier's facility. All factory tests shall be completed prior to shipment of any of the "System set-up" to the jobsite. The "System set-up" shall be fully assembled, programmed, and connected as it will be installed in the final configuration. If the "System set-up" is found to be not fully and completely ready for factory testing, the Contractor shall be responsible for paying for the Owner and Engineer to return for the factory testing. Factory testing is to ensure that there are no defects. The hardware and software shall be tested for compliance with the plans and Specifications included herein and for the ability to perform the control functions.

7. The testing shall not be started until the manufacturer has completed fabrication, wiring, setup, and programming; performed satisfactory checks and adjustments; factory testing sheets approved by Owner; and can demonstrate the system is complete and operational.
8. All components of the system setup shall be completely assembled and thoroughly pre-tested by the supplier or manufacturer before start of factory test.
9. Provide a complete clean copy of System Supplier drawings for Owner and Engineer's use during Factory Test. These drawings shall reflect the equipment being tested. If Owner Representative determines that these drawings do not adequately reflect the actual equipment being tested or differs substantially from the approved equipment submittal, the Owner Representative reserves the right to cancel the Factory Test as the equipment is found to be not fully and completely ready for factory testing. Equipment that differs substantially from the approved equipment submittal shall be resubmitted. Factory test will be rescheduled after revised submittals have been reviewed by the Engineer and marked "No Exceptions Taken" or "Make Corrections Noted". No extension of Contract time will be allowed.
10. The associated factory tests for each of the factory testing sheets that are to be performed by the supplier and witnessed by the Owner/Engineer shall include the following for the "System set-up" as a minimum:
 - a. Visual and mechanical Inspections of the panels as follows:
 - 1) Inspect for physical damage, proper support, and wiring.
 - 2) Check all starters, breakers, and other components for proper sizes.
 - 3) The Contractor shall fill in test form TF4 located in Appendix "A."
 - b. Testing of the Electrical Equipment as follows:
 - 1) Each line of control logic on the elementary or loop diagrams shall be checked. After a line of control logic is tested, the person performing test shall initial the corresponding line on the elementary diagram. When the complete elementary diagram has been checked, it shall be signed and dated by testing person and person witnessing test.
 - 2) I/O points to terminal blocks shall be simulated for the complete checkout of PLC interfaces through to the SCADA screens.

- 3) The tests, as a minimum, shall simulate all operating conditions including steady state, transients, upsets, startup, shutdown, power failure, and equipment failure conditions (for control logic).
- 4) The Contractor shall complete each test and fill in the I/O test form TF13 located in Appendix "A."
- 5) Testing of Control as follows:
 - a) To facilitate testing and system simulation of the "System Set-up", the Supplier shall connect a separate toggle two position on-off switch to each status and alarm digital input. Three digital multi-meters (minimum +/- 0.2% accuracy) with clip-on leads shall be supplied and utilized during testing for measurement of digital and analog outputs. The supplier shall use simulated input signals to replicate varying field device signals during the factory tests in order to verify the proper functioning of hardware and software.
- 6) The structured factory tests to be performed by the System Supplier and witnessed by the Owner shall include the following as a minimum:
 - a) Control Checkout Tests: Simulate the digital or analog signals (or combination thereof) at the panel field terminals using the test hardware to verify that each control is functional and properly configured. Verify that all parameters (i.e., relay logic operations, relay timing, controller setpoints, etc.) of the control system are defined and operate according to the design documents.
 - b) Alarm Checkout Tests: Simulate the digital or analog signals (or combination thereof) at the panels using the test hardware to verify that each I/O point is functional and properly configured. Verify that all parameters (i.e., description, engineering units, span, enable/disable, setpoints, runtimes, totalization, logic type, etc.) of the alarms are defined and operate according to the Specifications.
- 7) Unstructured factory tests are required as part of the factory testing phase. These additional tests shall include any and all unstructured tests as directed by the Owner or Engineer. The various unstructured tests shall include, but are not limited to, the following:
 - a) Verify the correct inventory of hardware, etc. All spare parts shall be included in the inventory.

- b) The factory tests, as a minimum, shall simulate all normal and abnormal operating conditions including steady state, change of state, variable changes, fluctuations, transients, upsets, start-up, shutdown, power failure, and equipment failure conditions.
11. The factory test will be considered complete only when the integrated system setup has successfully passed all tests, both structured and unstructured, to the satisfaction of the Owner or Engineer and the Factory Test checkout form TF11 has been signed & dated by Owner. No equipment shall be shipped to jobsite without authorization from the Owner or Owner's representative that the factory test has been completed.
 12. Acceptance and witnessing of the factory tests does not relieve or exclude the Contractor from conforming to the requirements of the Contract Documents.
 13. The testing personnel shall provide all material, equipment, labor and technical supervision to perform such tests and inspections.
 14. During the testing period, under the supervision of the supplier, the Engineer and other Owner personnel shall have unlimited and unrestricted access to the usage and testing of all hardware and software in the system.
 15. Spare I/O for the system shall also be tested during this test period.
 16. The Contractor shall pay all expenses incurred by his personnel, including labor, material, transportation, lodging, daily subsistence, and other associated incidental costs during the factory testing.
 17. Faulty and/or incorrect hardware operation of major portions of the system may, at the discretion of the Owner Engineer, be cause for suspension or restarting of the entire factory test, at no additional cost to the Owner or extension in contract time.
 18. The factory test will be considered complete only when the system setup has successfully passed all tests both structured and unstructured to the satisfaction of the Owner Engineer. No equipment shall be installed without authorization from the Owner Engineer that the factory test has been completed.
 19. All modifications to drawings and documentation as a result of the factory tests shall be corrected and completed before shipment of drawings with equipment and the submittal and delivery of "operation and maintenance" manuals.

20. Copies of the completed, signed, and witnessed factory testing forms shall be placed in the Operation and Maintenance Manual.

E. ELECTRICAL FIELD TESTS

1. Prior to any field testing, Operation & Maintenance Manuals shall have been submitted by the Contractor and approved by the Engineer.
2. The Contractor shall engage and pay for the services of an approved qualified testing company for the purpose of performing inspections and tests as herein specified. The testing company shall provide all material, equipment, labor and technical supervision to perform such tests and inspections. The Electrical Contractor shall be present on site for all field tests.
3. The Electrical Contractor shall complete and submit "Schedule Test Request Form" as illustrated in Appendix "A" for each electrical field test.
4. The Electrical Contractor shall be at the jobsite to assist with all Electrical Field Tests.
5. PRE-ENERGIZATION TESTS: These tests shall be completed prior to applying power to any equipment.

a. INSPECTIONS

- 1) Visual and mechanical inspections:
 - a) Inspect for physical damage, proper anchorage and grounding.
 - b) Compare equipment nameplate data with design plans and starter schedule.
 - c) Compare overload setting with motor full load current for proper size.
- 2) The Contractor shall fill in, for each piece of equipment, Test Form TF4 located in Appendix "A."

b. TORQUE CONNECTIONS

- 1) All electrical, mechanical and structural threaded connections inside equipment shall be tightened in the field after all wiring connections have been completed. Every worker tightening screwed or bolted connections shall be required to have and utilize a torque screwdriver/wrench at all times. Torque connections to the value recommended by the equipment manufacturer. If they are not available, use NEC Annex I for torque values as guidelines.

c. WIRE INSULATION & CONTINUITY TESTS

- 1) All devices that are not rated to withstand the 500V megger potential shall be disconnected prior to the megger tests.
- 2) Megger insulation resistances of all 600 volt insulated conductors using a 500 volt megger for 10 seconds. Make tests with circuits installed in conduit and isolated from source and load. Each field conductor shall be meggered conductor to conductor and conductor to ground. These tests shall be made on cable after installation with all splices made up and terminators installed but not connected to the equipment.
- 3) Each megger reading shall not be less than 10 Meg-ohms resistive. Corrective action shall be taken if values are recorded less than 10 Meg-ohms. Values of different phases of conductors in the same conduit run showing substantially different Meg-ohm values, even if showing above 10 Meg-ohms shall be replaced.
- 4) Each instrumentation conductor twisted shielded pair shall have the conductor and shield continuity measured with an ohmmeter. Conductors with high ohm values, that do not match similar lengths of conductors the same size, shall be replaced at no additional cost to the Owner.
- 5) The Contractor shall fill in test forms Power and Control Conductor Test Form TF1 and Instrumentation Conductor Test Form TF2 located in Appendix "A."

d. GROUNDING SYSTEM TESTS

- 1) Visual and Mechanical Inspection:
 - a) Verify ground system is in compliance with Drawings and Specifications.
- 2) Electrical Tests:
 - a) Before backfilling trenches, and placement of sidewalks, landscape and paving, measure the resistance of each electrode to ground using a ground resistance tester. Perform the test not less than two days after the most recent rainfall and in the afternoon after any ground condensation (dew) has evaporated.
 - b) After all individual ground electrode readings have been made, interconnect as required and measure the system's ground resistance.

- c) The grounding test shall be in conformance with IEEE Standard 81.
- d) Measurements shall be made at 10 feet intervals beginning 25 feet from the test electrode and ending 75 feet from it in a direct line between the system being tested and the test electrode.
- e) Point-to-Point: Perform point-to-point tests to determine the resistance between the main grounding system and all major electrical equipment frames, system neutral, and/or derived neutral points.

3) Test Values:

- a) The resistance between the main grounding electrode and equipment ground shall be no greater than five ohms per IEEE Standard 142.
- b) Investigate point-to-point resistance values that exceed 0.5 ohms.
- c) Plots of ground resistance shall be made and submitted to the Engineer for approval.

4) The Contractor shall fill in Grounding System Test Form TF3 located in Section 16010 Appendix "A."

e. PANELBOARD TESTS

1) Visual and Mechanical Inspection:

- a) Inspect for physical damage, proper anchorage and grounding.
- b) Compare equipment nameplate data with design plans and panelboard schedules.
- c) Compare breaker legend for accuracy.
- d) Check torque of bolted connections.

2) The Contractor shall fill in Panelboard Test Form TF5 located in Appendix "A."

f. BREAKER TEST

- 1) All breakers shall be checked for proper mounting, conductor size, and feeder designation. Operate circuit breaker to ensure smooth operation. Inspect case for cracks or other defects. Check

tightness of connection with torque wrench in accordance with manufacturer's recommendations.

- 2) All breakers 100 amps and above shall be tested. Time current characteristic tests shall be performed bypassing three hundred percent (300%) rated current through each pole separately. Trip amps and time shall be measured. Instantaneous pickup current shall be determined by run up or pulse method. Clearing times should be within four (4) cycles or less. All trip times shall fall within NETA Table values. Instantaneous pickup current levels should be within 20% of manufacturer's published values. Certification stickers, listing date and company who performed the tests, shall be attached to the inside of the breaker compartment door right after the breaker has passed all tests.
- 3) Contact and Insulation Resistance: Contact resistance shall be measured and be compared to adjacent poles and similar breaker. Deviations of more than 50% shall be reported to Engineer. Insulation resistance shall be measured and shall not be less than 50 megohms.
- 4) At end of test the all breakers trip settings shall be set by Contractor to values listed in protective device coordination study to properly protect equipment.
- 5) The Contractor shall fill in MCC Device Test Form TF8 and Breaker Test Form TF9 located in Appendix "A."

6. POST ENERGIZATION TESTS

a. PANELS AND ENCLOSURE TESTS

- 1) During these tests, test all local and remote control operations and interlocks.
- 2) Electrical Tests:
 - a) Perform operational tests by initiating control devices to affect proper operation.
 - b) The Contractor shall fill in Operational Device Checks and Tests Form TF6.

b. PHASE ROTATION TESTS

- 1) Check connections to all equipment for proper phase relationship. During this test, disconnect all devices which could be damaged by the application of voltage or reversed phase sequence. Three

phase equipment shall be tested for the phase sequence "ABC" front to back, left to right, and top to bottom.

- 2) All three phase motors shall be tested for proper phase rotation. Revise wire color codes to indicate correct phase color if wires are swapped.
- 3) The Contractor shall fill in Phase Rotation Test Form TF7 located in Appendix "A."

c. MOTOR TESTING

- 1) Record the amperage draw on all phases of each motor operating under full load. Ensure that these values do not exceed the motor nameplate full load amperage.
- 2) Record the voltage between all phases of each motor operating under full load. If the voltage balance is not within plus or minus 5 percent of nominal, request the Utility power company or other responsible party to correct the problem.
- 3) The Contractor shall compile, by visual inspection of equipment installed for each motor, the following data in neatly tabulated form and be placed in the O&M manual:
 - a) Equipment driven.
 - b) Motor horsepower.
 - c) Nameplate amperes.
 - d) Service factor.
 - e) Temperature rating.
 - f) Overload catalog number.
 - g) Overload current range and setting.
 - h) Circuit breaker rating.
 - i) Circuit breaker trip setting, for magnetic only circuit breakers.
- 4) The Contractor shall fill in Motor Test Form TF10, located in Appendix "A."

d. INSTRUMENTATION TESTS

- 1) The Contractor shall provide a minimum of two (2) hours of field acceptance testing for each instrument. If any instrument has not been fully tested during its allotted time, the Contractor shall provide additional hours for finishing testing of the instrument, to be paid by the Contractor.
- 2) The overall accuracy of each instrument loop shall be checked to ensure that it is within acceptable tolerance.
 - a) As a minimum, all the tests indicated/specified on the test form TF14 in Appendix "A" shall be performed by the Contractor for each of the instruments listed in Appendix "B" Device Index.
- 3) Test equipment used for testing shall be of suitable quality so as not to mask performance deficiencies. All test equipment shall be traceable to National Bureau of Standards and have been calibrated within six months of test date.
- 4) Testing shall be accomplished using simulated inputs only with prior written approval of the Owner.
- 5) Calibration stickers shall be supplied for all equipment and instruments. Calibration stickers shall list the following information:
 - a) Tag number.
 - b) Calibrated by who (name), firm, city and telephone number.
 - c) Date calibrated.
 - d) Calibration range.
 - e) Comments.

e. CONTROL SYSTEM TESTS

- 1) All the I/O points for the PLC shall be tested by the System Supplier with assistance from Contractor in the field for proper operation of alarms, status, analog, control, autodialer and operator interface (OI) display functions, etc. Where practical, the final element shall be used, i.e. trip the intrusion switch or change levels. Testing shall be accomplished using simulated inputs only when necessary.
- 2) During this task the System supplier shall have:
 - a) Qualified field technician with experience in the startup of similar systems with PLC controls, and other field devices.
 - b) PLC/OI/SCADA programmer for modifying or adjusting all PLC registers and setpoints to tune the system.

- c) Test instruments as required.
 - d) A pair of radios for communication.
 - e) Portable PC loaded with diagnostic, configuration, programming PLC software. The latest application programs shall have been loaded on the PLC.
- 3) All SCADA graphics shall be tested during the field tests.
 - 4) Contractor to fill in "I/O Point Checkout Sheet" TF13 located in Appendix "A."

7. TRIAL OPERATIONS:

- a. The entire electrical installation shall be either tested or trial operated to verify Contract compliance. That is, controls, heaters, fans, light switches, convenience receptacles, lights, etc. shall be trial operated. Contractor shall conduct trial operations in the presence of the Engineer and Operations and Maintenance personnel.

F. OPERATIONAL TESTING

- 1. After all the previous tests in this subsection are complete, the Contractor shall conduct operational testing.
- 2. The Contractor shall demonstrate operation of each part of the control and instrumentation system to the satisfaction of the Owner and/or Engineer. Tests shall be repeated by the Contractor at no additional cost to the Owner and at the discretion of the Owner and/or Engineer to resolve whether the system has been demonstrated that it will operate under all modes of operations and varying conditions.
- 3. For the operational testing the new equipment shall be activated to automatically run for 5 days, Monday through Friday 24 hours a day. During this five day period the Owner will run the different combinations of the pump control options. If equipment failure occurs during the 5 days of operational testing, the Contractor shall repair or replace the defective equipment and shall begin another 5 day operational test, Monday through Friday 24 hours a day. This shall be continued until the new equipment functions acceptably for 5 consecutive days.
- 4. The Electrical Contractor, testing firm and System Supplier shall re-visit the jobsite as often as necessary until all field tests, start-up and operation tests are completed and approved.

3.09 OPERATION AND MAINTENANCE MANUALS

- A. Four (4) sets of operating manuals covering instruction and maintenance on each type of equipment shall be furnished prior to completion of the project.
- B. These instructions shall provide the following as a minimum:
 - 1. Each set bound in a three ring binder and organized as specified herein.
 - 2. A complete "Record" set of favorably reviewed electrical submittals as provided under SUBMITTAL AND DRAWING REQUIREMENTS.
 - 3. As-built one-line, elevation, loop, and elementary drawings with all field changes included.
 - 4. A complete list of the equipment supplied, including serial numbers, ranges, options, and pertinent data necessary for ordering replacement parts.
 - 5. Full, technical specifications on each item.
 - 6. Detailed service, maintenance and operation instructions for each item supplied. Schematic diagrams of all electronic devices shall be included. A complete parts list with stock numbers shall be provided on the components that make up the assembly.
 - 7. Safety precautions and procedures.
 - 8. Special maintenance requirements particular to this system shall be clearly defined, along with special calibration and test procedures.
 - 9. Include all completed and signed test data and forms from field testing.
 - 10. No photo copies are allowed of standard published manuals available from manufacturers,. All of the manuals shall be originals.
 - 11. All of these sets of O & M Manuals shall be made up of "original" (no copies, PDFs or reproductions) documents. No photo or fax copies are allowed of standard published manuals available from Manufacturers.
 - 12. Warranty certificate with start dates, duration and contact information.
 - 13. Troubleshooting instructions.
- C. At the end of the project these manuals shall be updated to show "as-built or as-installed" conditions.

- D. Provide to the Owner four (4) sets of USB drives with lanyards and two sets of CDs containing all documents in both PDF format and unlocked AutoCAD - DWG format (version 2010 or later):
1. As-built Contract electrical and instrumentation drawings prepared for this project.
 2. As-built set of all required Drawings for the project.
 3. As-built sets of other computer generated documents prepared for this project, including PLC ladder logic files, and Bill of Materials prepared for this project.
 4. Software ladder logic programs.
 5. Software OI programs.
 6. Software SCADA configuration.
 7. Wireless module Configuration
 8. As-built sets of other computer generated documents prepared for this project, including PLC ladder logic files, and Bill of Materials prepared for this project.
 9. Electronic PDF version of O&M manual. Version format shall follow the hard copy submittal of the O&M, including index, equipment record sheet, warranty information, theory of operation, maintenance instruction, etc. PDF shall "bookmarked" to at each index and subtab listed in O&M.
 10. These files shall be the property of the Owner, for its use on this and future projects.
 11. Label drives with clear plastic with black machine printed lettering as produced by a KROY or similar machine. The size of the nameplate tape shall be with 3/8-inch lettering unless otherwise approved by the Engineer. Securely fasten nameplates in place on the USB drive using the adhesion of the tape.

3.10 TRAINING

- A. All training sessions shall be held on dates and times agreeable to Owner. A total of 5 or less Owner personnel shall be trained.
- B. After Operation Testing has started the Contractor shall provide a period of not less than 8 hours training for instruction of operation and maintenance personnel in the use of all the new control and instrumentation systems including operator interface screens. The Contractor shall make necessary

arrangements with manufacturer's representative. Provide product literature and application guides for user's reference during instruction.

- C. Training to include instruction on the use, operation, calibration, programming, and maintenance of the field devices listed in Appendix "B."
- D. Acceptable Operation and Maintenance Manuals shall be on site and available when training sessions are implemented.

3.11 SPARE PARTS

- A. The Contractor shall supply all spare parts prior to start of field tests. All parts shall be sealed in plastic bags and delivered to the site in a heavy duty plastic storage bag. Bag shall be clearly labeled with part name and number and the corresponding equipment tagname.
- B. The Contractor shall make available any replacement parts that are not manufacturer's normal stock items for immediate service and repair of all the instrumentation equipment throughout the warranty period.
- C. The following spare parts shall be provided to the Owner as part of this Contract:
 - 1. Five (5) fuses for each type of fuse.
 - 2. Twenty (20) lamps for each type of light.
 - 3. Two (2) relays for each type of control, power fail and time delay relay.
- D. See other Division 16 sections for additional spare parts to be provided.

3.12 WARRANTY

- A. The Contractor shall have a staff of experienced personnel available to provide service on 2 working days' notice during the warranty period. Such personnel shall be capable of fully testing and diagnosing the hardware, software and implementing corrective measures.
- B. If the Contractor "fails to respond" in 2 working days, the Owner at its option will proceed to have the warranty work completed by other resources; the total cost (direct and indirect) for these other resources shall be reimbursed in full by the Contractor.
 - 1. "Fail to respond" shall be defined as: The Contractor has not shown a good faith effort and has not expended adequate resources to correct the problem.

2. The use of other resources, as stated above, shall not change or relieve the Contractor from fulfilling the remainder of the warranty requirements.
- C. The Contractor shall reimburse Owner for all direct and indirect costs associated with Owner repairs.
- D. The Contractor shall warrant all electrical equipment for a period of one (1) year from date of final acceptance. Standard published warranties of equipment which exceed the preceding specified length of time shall be honored by the manufacturer or supplier.
- E. Prior to "final acceptance", the Contractor shall furnish to the Engineer a listing of warranty information for all manufacturers of materials, instruments, and equipment used on the project. The listing shall include the following:
 1. Manufacturer's name, service contact person, phone number, and address.
 2. Material and equipment description, equipment number, part number, serial number, and model number.
 3. Manufacturer's warranty expiration date.
- F. The Contractor shall provide all labor and material to troubleshoot, program, replace, or repair any hardware or software that fails or operates unpredictably during the warranty period, at no additional cost to the Owner.
- G. Each time the Supplier's repair person responds to a system malfunction during the warranty period, he or she must contact the designated Owner maintenance supervisor for scheduling of the work, access to the jobsite, and permission to make repairs. Operation of facilities necessary to test equipment shall only be performed by or under the direction Owner staff. Owner reserves the right at its sole discretion to deny operations requested by the Supplier. A written description of all warranty work performed shall be documented on a field service report to be given to Owner prior to the repair person leaving job site. This field service report shall detail and clearly state problem, corrective actions taken, additional work that needs to be done, data, repair person name and company.

3.13 FINAL ACCEPTANCE

- A. Final acceptance will be given by the Owner after the equipment has passed the "operational testing trial period," each deficiency has been corrected, final documentation has been provided, and all the requirements of design documents have been fulfilled.
- B. Upon completion of the project, prior to final acceptance, remove all temporary services, equipment, material, and wiring from the site.

C. At the end of the project, following the completion of the field tests, and prior to final acceptance, the Supplier shall provide the following to the Owner:

1. Listing of warranty information.
2. Each "operation and maintenance" manual shall be modified or supplemented by the Supplier to reflect all field changes and as-built conditions.
3. Two (2) CD disk copies of all final documentation to reflect as-built conditions.

D. Prior to final acceptance:

1. Submit each key with matching duplicate. Wire all keys for each lock securely together. Tag and plainly mark with lock number or equipment identification, and indicate physical location, such as panel or switch number.
2. Verify that as-installed drawings have been placed in all new or modified panels.

APPENDIX "A"

TEST FORMS

Index of Forms:

Bill of Material

Schedule Test Request Form

TF1 Power and Control Conductor Test Form

TF2 Instrumentation Conductor Test Form

TF3 Grounding System Test Form

TF4 Visual and Mechanical Inspection Form

TF5 Panelboard Test Form

TF6 Operational Device Checks and Tests Form

TF7 Phase Rotation Test Form

TF8 MCC Device Test Form

TF9 Breaker Device Test Form

TF10 Motor Test Form

TF11 Factory Test Checkout Form

TF13 I/O Point Checkout Test Sheet

TF14 Instrument Data Sheet and Calibration Record

BILL OF MATERIAL

PROJECT: _____
LOCATION: _____

DATE / /
PAGE

[illegible]

SCHEDULED TEST REQUEST FORM

COMPANY PERFORMING TEST: _____
TESTING PERSONNEL : _____
PHONE NUMBER OF COMPANY: _____
TEST PROCEDURE SUBMITTAL: _____ APPROVED : ____/____/____
SCHEDULED TEST DATE : _____ DATE : ____/____/____

TIME	DESCRIPTION OF TEST
8:00	
9:00	
10:00	
11:00	
12:00	
13:00	
14:00	
15:00	
16:00	

NOTES:

TESTED BY : _____ DATE : ____/____/____
WITNESSED BY: _____

POWER AND CONTROL CONDUCTOR TEST FORM

TEST FORM (TF1)

EQUIPMENT

NAME : _____ LOCATION : _____

[illegible]

NOTES:
Record insulation test values in meg-ohms.

TESTED BY : _____ DATE : ____/____/____

WITNESSED BY: _____

DATE : / /

INSTRUMENTATION CONDUCTOR TEST FORM

TEST FORM (TF2)

EQUIPMENT

NAME : _____ LOCATION : _____

CONDUCTOR PAIR NUMBER	CONTINUITY TESTS		INSULATION TESTS		
	CONDUCTOR TO CONDUCTOR	CONDUCTOR TO SHIELD	CONDUCTOR TO CONDUCTOR	CONDUCTORS TO GROUND*	SHIELD TO GROUND

NOTES:

* With both conductors tied together

Record continuity test values in ohms.

record insulation test values in meg-ohms.

TESTED BY : _____

DATE : ____/____/____

WITNESSED BY: _____

GROUNDING SYSTEM TEST FORM

TEST FORM (TF3)

FALL IN POTENTIAL TEST

MAIN GROUND LOCATION	APPLIED VOLTAGE V	MEASURED POINT 1 VOLTAGE	MEASURED POINT 2 VOLTAGE	MEASURED POINT 3 VOLTAGE	CALCULATED RESISTANCE OHMS

TWO POINTS TESTS

EQUIPMENT NAME	EQUIPMENT #	CIRCUIT #	APPLIED CURRENT	MEASURED VOLTAGE	CALCULATED RESISTANCE OHMS

NOTES:

TESTED BY : _____
WITNESSED BY: _____

DATE : ____/____/____

VISUAL AND MECHANICAL INSPECTION FORM

TEST FORM (TF4)

EQUIPMENT

NAME : _____ LOCATION : _____

NAMEPLATE DATA

MFGR. :	_____	SERIES # :	_____
MODEL # :	_____	U.L. # :	_____
VOLTAGE :	_____	PHASE :	_____
AMPERAGE :	_____	SERVICE :	_____
BUS TYPE :	_____	BUS BRACING:	_____
VERT. BUS :	_____	HORZ. BUS :	_____
GND. BUS :	_____	NEU. BUS :	_____
ENCLOSURE :	_____		_____
	_____		_____

INSPECTION CHECK LIST

ENTER: A-ACCEPTABLE R-NEEDS REPAIR OR REPLACEMENT NA-NOT APPLICABLE

TIGHTEN ALL BOLTS AND SCREWS	_____
TIGHTEN ALL WIRING AND BUS CONNECTIONS	_____
VERIFY ALL BREAKERS AND FUSES HAVE PROPER RATING	_____
CHECK BUS BRACING AND CLEARANCE	_____
CHECK MAIN GROUNDING CONNECTION AND SIZE	_____
INSPECT GROUND BUS BONDING	_____
CHECK EQUIPMENT GROUNDS	_____
CHECK CONDUIT GROUNDS AND BUSHINGS	_____
INSPECT NEUTRAL BUS AND CONNECTIONS	_____
CHECK HEATERS AND THERMOSTATS	_____
CHECK VENTILATION AND FILTERS	_____
CHECK FOR BROKEN OR DAMAGED DEVICES	_____
CHECK DOOR AND PANEL ALIGNMENT	_____
INSPECT ANCHORAGE	_____
CHECK FOR PROPER CLEARANCES AND WORKING SPACE	_____
REMOVE ALL DIRT AND DUST ACCUMULATION	_____
INSPECT ALL PAINT SURFACES	_____
CHECK FOR PROPER WIRE COLOR CODES	_____
INSPECT ALL WIRING FOR WIRE LABELS	_____
CHECK FOR PROPER WIRE TERMINATIONS	_____
CHECK FOR PROPER WIRE SIZES	_____
INSPECT ALL DEVICES FOR NAMEPLATES	_____
CHECK IF DRAWINGS MATCH EQUIPMENT	_____
CHECK ACCURACY OF OPERATION & MAINTENANCE	_____

TESTED BY : _____

DATE : ____/____/____

WITNESSED BY: _____

PANEL-BOARD TEST FORM

TEST FORM (TF5)

PANEL NAME: _____ LOCATION : _____

NAMEPLATE DATA

MFGR. :	_____	SERIES # :	_____
MODEL # :	_____	U.L. # :	_____
VOLTAGE :	_____	PHASE :	_____
AMPERAGE :	_____	SERVICE :	_____
BUS TYPE :	_____	BUS BRACING:	_____
VERT. BUS :	_____	HORZ. BUS :	_____
GND. BUS :	_____	NEU. BUS :	_____
ENCLOSURE :	_____	MAIN BKR :	_____

INSULATION RESISTANCE TESTS - MEGOHMS

A-GND	B-GND	C-GND			

INSPECTION CHECK LIST

ENTER: A-ACCEPTABLE R-NEEDS REPAIR OR REPLACEMENT NA-NOT APPLICABLE

TIGHTEN ALL BOLTS AND SCREWS	_____
TIGHTEN ALL WIRING AND BUS CONNECTIONS	_____
VERIFY ALL BREAKERS AND FUSES HAVE PROPER RATING	_____
CHECK BUS BRACING AND CLEARANCE	_____
CHECK MAIN GROUNDING CONNECTION AND SIZE	_____
INSPECT GROUND BUS BONDING	_____
CHECK EQUIPMENT GROUNDS	_____
CHECK CONDUIT GROUNDS AND BUSHINGS	_____
INSPECT NEUTRAL BUS AND CONNECTIONS	_____
CHECK FOR BROKEN OR DAMAGED DEVICES	_____
CHECK DOOR AND PANEL ALIGNMENT	_____
INSPECT ANCHORAGE	_____
CHECK FOR PROPER CLEARANCES AND WORKING SPACE	_____
REMOVE ALL DIRT AND DUST ACCUMULATION	_____
INSPECT ALL PAINT SURFACES	_____
CHECK FOR PROPER WIRE COLOR CODES	_____
INSPECT ALL WIRING FOR WIRE LABELS	_____
CHECK FOR PROPER WIRE TERMINATIONS	_____
CHECK FOR PROPER WIRE SIZES	_____
INSPECT ALL DEVICES FOR PROPER LEGEND NAMEPLATES	_____

CALIBRATION TEST EQUIPMENT PART NO.

DATE CALIBRATED:

TESTED BY : _____

DATE : ____/____/____

WITNESSED BY: _____

OPERATIONAL DEVICE CHECKS AND TESTS FORM

TEST FORM (TF6)

NAME : _____

LOCATION : _____

[illegible]

TESTED BY : _____ DATE : ____/____/____
WITNESSED BY : _____

NOTES:

PHASE ROTATION TEST FORM

TEST FORM (TF7)

EQUIPMENT NAME	EQUIPMENT #	CIRCUIT #	PHYSICAL PHASE LOCATION	PHASE COLOR CODE	MEASURED PHASE ROTATION

NOTES:

Use phase tester to verify all circuits and equipment have a clockwise A-B-C phase rotation.

Physical phase locations: Left to Right - LR or Top to Bottom - TB

Phase color codes: Brown, Orange, & Yellow -BOY

Black, Red, & Blue -BkRBe

TESTED BY : _____

WITNESSED BY: _____

DATE : ____/____/____

MCC DEVICE TEST FORM

TEST FORM (TF8)

MCC # : _____ CUBICLE : _____
EQUIP NAME: _____ EQUIP # : _____

MOTOR DATA

CONTACTOR DATA

H.P. : _____ MFGR. : _____ PART # : _____
F.L.A. : _____ NEMA SIZE : _____ COIL VOLT : _____

OVERLOAD TESTS

MFGR. : _____ HEATER # : _____ RANGE : _____
PART # : _____ FINAL OVERLOAD SETTING: _____

TEST
AMPS

MEASURE TRIP TIME @ TEST AMPS

MFGR LISTED
TRIP TIME

AMBIENT
COMPENSATION

PHASE A

PHASE B

PHASE C

BREAKER TESTS

MRGR. : _____ PART # : _____ FRAME # : _____

CONTACT RESISTANCE TESTS - OHMS

INSULATION RESISTANCE TESTS-MEGOHMS

PHASE A

PHASE B

PHASE C

A-GND

B-GND

C-GND

MFGR TRIP TIME @300% MIN: _____
MFGR TRIP TIME @300% MAX: _____

BREAKER RATING / RANGE: _____
FINAL BREAKER SETTING: _____
MFGR INST. PICKUP AMPS: _____

TIME-CURRENT TEST

TRIP TIME IN SECONDS @ 300% AMPS

INSTANTANEOUS TRIP TEST - AMPS

PHASE A

PHASE B

PHASE C

PHASE A

PHASE B

PHASE C

NOTES:

TESTED BY : _____
WITNESSED BY: _____

DATE : ____ / ____ / ____

BREAKER DEVICE TEST FORM

TEST FORM (TF9)

FEEDER : _____	LOCATION : _____
EQUIP NAME: _____	EQUIP # : _____
EQUIP H.P. : _____	EQUIP KVA : _____
MFGR. : _____	PART # : _____
VOLTAGE : _____	FRAME # : _____
	INTERRUPT : _____
	CHARACTER: _____
	RATING CURVE

CONTACT RESISTANCE TESTS - OHMS INSULATION RESISTANCE TESTS - MEGOHMS

PHASE A	PHASE B	PHASE C	A-GND	B-GND	C-GND

MFGR TRIP TIME @300% MIN : _____	BREAKER RATING / RANGE: _____
MFGR TRIP TIME @300% MAX: _____	FINAL BREAKER SETTING : _____
	MFGR INST. PICKUP APMS: _____

TEST-CURRENT TESTS			INSTANTANEOUS TRIP TEST - AMPS		
TRIP TIME IN SECONDS @ 300% AMPS			INSTANTANEOUS TRIP TEST - AMPS		
PHASE A	PHASE B	PHASE C	PHASE A	PHASE B	PHASE C

ADDITIONAL TESTS AND SETTING AS APPLICABLE

FUNCTION	PICKUP		DELAY-TIME		
	RANGE	SETTING	RANGE	SETTING	
LONG TIME					
SHORT TIME					
GROUND FLT.					

NOTES:

TESTED BY : _____	DATE : ____/____/____
WITNESSED BY: _____	

MOTOR TEST FORM

TEST FORM (TF10)

EQUIPMENT

NUMBER : _____ NAME : _____

NAMEPLATE DATA - FIELD RECORDED

MANUFACTURER		MODEL #		SERIAL #		FRAME #	
H.P.	R.P.M	F.L.A	VOLTS	PHASE	FREQ.	P.F.	S.F.
CODE	N.E.M.A.	INSUL.	ENCLOS.R.	DUTY	DESIGN		

INSULATION TESTS PHASE TO GROUND MEG-OHMS			MOTOR FRAME GROUNDING SYSTEM TEST			MOTOR HEATER MEAS. AMPS	MOTOR THERMAL TRIP TEST
A	B	C	APPLIED VOLTS	MEAS. AMPS	CALC. OHMS		

MOTOR TESTS - MEASURED VALUES

AMPERAGE			VOLTAGE			POWER FACTOR	WATTAGE
A	B	C	AB	BC	CA		

NOTES:

VOLTAGE, AMPERAGE, POWER FACTOR, & WATTAGE SHALL BE RECORDED WITH A TRUE RMS METER.

TESTED BY : _____

DATE : ____/____/____

WITNESSED BY: _____

FACTORY TEST
MCC/CONTROL PANEL CHECKOUT FORM (TF11)

Manufacturer: _____ **Location:** _____
Job No.: _____
Tel: _____ **Fax:** _____

MCC / Control Panel: _____ **TEST RESULT**

OVERALL PANEL INSPECTION

Pass **Fail**

1. All front panel and back panel components mounted securely.....	☐	☐
2. All wiring terminated and labeled correctly.....	☐	☐
3. All components, wiring, and labeling accurately reflected on the drawings..	☐	☐

POWER-UP INSPECTION

1. Voltage levels on load side of circuit breakers.....	☐	☐
2. Voltage levels at the DC terminals of the power supply.....	☐	☐
3. Voltage levels at the DC power distribution terminals.....	☐	☐

POWER DISTRIBUTION AND GENERAL COMPONENT TESTING

1. Power distribution to the appropriate components.....	☐	☐
2. Operation of the ancillary components such as receptacles, work lights, etc.	☐	☐

CONTROL COMPONENTS CHECKS

1. Operators (push buttons, selector switches, pilot lights).....	☐	☐
2. Inputs from External Sources.....	☐	☐
3. Outputs to External Sources.....	☐	☐
4. Relay Logic.....	☐	☐
5. PLC I/O and Program Verification.....	☐	☐
6. O/I Display Verification.....	☐	☐

Notes:

- For relay logic checks, each rung of the elementary or loop diagram is to be highlighted in yellow as they are verified for correct control functions.
- For PLC I/O and program verification, the control strategies shall be highlighted in yellow as each logic function is tested.

Tested by: _____ **Witnessed by:** _____

Date: _____

I/O POINT CHECKOUT TEST FORM

TEST FORM (TF13)

I/O TYPE : _____

LOCATION : _____

[illegible]

NOTES:

TESTED BY : _____
WITNESSED BY: _____

DATE : ____/____/____

INSTRUMENTATION DATA SHEET AND CALIBRATION RECORD TEST FORM (TF14)

<u>Component Description</u>			<u>Manufacturer</u>		<u>Location</u>
			Name _____		Site _____
<u>Component Tag Name</u>			Model _____		Equip _____
			Serial # _____		
<u>Indicator Range</u>	<u>Range</u>	<u>Unit</u>	<u>General Notes</u> 1) Attach Calibration Curves for dp Flowmeters 2) Include mounting elevations for level Instruments 3) All entries within solid box to be typed in prior to start of test		
<u>Input Range</u>					
<u>Output Range</u>					
<u>Designed Calibration</u>			<u>Measured Calibration</u>		
<u>Input Signal</u>	<u>Output</u>	<u>Eng. Value</u>	<u>Input</u>	<u>Output</u>	<u>Comments</u>
<u>Notes</u> _____ _____ _____ _____ _____					
<u>Tested by (Print Name)</u> _____ <u>Witnessed by (Print Name)</u> _____					
<u>Signature</u> _____			<u>Signature</u> _____		
<u>Date</u> / /			<u>Date</u> / /		

APPENDIX "B"

DEVICE INDEX

SECTION 16010 -APPENDIX "B" DEVICE INDEX

E-DWG	P&ID DWG	TAG	NO.	DESCRIPTION	TYPE	SPECIFICATION	MINIMUM NEMA RATING	SIZE	SP / RANGE	UNITS	DWG REF DET MOUNTING	NOTES AND ACCESSORIES	201 TEST FORM
E12	I2	LSH	151	Level Switch	Float	16010-2.09.A	CL1,DIV2	-	2123.5	Elev	E7-E		TF-7
E12	I2	LSHH	151	Level Switch	Float	16010-2.09.A	CL1,DIV2	-	2130.7	Elev	E7-E		TF-7
E12	I2	LSLL	151	Level Switch	Float	16010-2.09.A	CL1,DIV2	-	2121.6	Elev	E7-E		TF-7
E12	I2	LT	151	Level Transducer	Sub	16010-2.09.B	CL1,DIV2	-	0-12	FT	E7-C		TF-7
-	I2	MS	111	Moisture Switch	Cond	Division 11	-	-	-	-	Seal	Relay In Pedestal	TF-7
-	I2	MS	112	Moisture Switch	Cond	Division 11	-	-	-	-	Seal	Relay In Pedestal	TF-7
-	I2	TS	111	Temperature Switch	N.C.	Division 11	-	-	-	-	Motor	Relay In Pedestal	TF-7
-	I2	TS	112	Temperature Switch	N.C.	Division 11	-	-	-	-	Motor	Relay In Pedestal	TF-7
E2	I2	ZS	191	A~B Position Switch	N.C.	16010-2.09.C	-	-	-	-	Door		TF-7
E22	I3	LSH	251	Level Switch	Float	16010-2.09.A	CL1,DIV2	-	2053.0	Elev	E7-E		TF-7
E22	I3	LSHH	251	Level Switch	Float	16010-2.09.A	CL1,DIV2	-	2053.5	Elev	E7-E		TF-7
E22	I3	LSLL	251	Level Switch	Float	16010-2.09.A	CL1,DIV2	-	2051.0	Elev	E7-E		TF-7
E22	I3	LT	251	Level Transducer	Sub	16010-2.09.B	CL1,DIV2	-	0-10	FT	E7-C		TF-7
-	I3	MS	211	Moisture Switch	Cond	Division 11	-	-	-	-	Seal	Relay In Pedestal	TF-7
-	I3	MS	212	Moisture Switch	Cond	Division 11	-	-	-	-	Seal	Relay In Pedestal	TF-7
-	I3	TS	211	Temperature Switch	N.C.	Division 11	-	-	-	-	Motor	Relay In Pedestal	TF-7
-	I3	TS	211	Temperature Switch	N.C.	Division 11	-	-	-	-	Motor	Relay In Pedestal	TF-7
E2	I3	ZS	291	A~B Position Switch	N.C.	16010-2.09.C	-	-	-	-	Door		TF-7

****END OF SECTION****

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SECTION 16605
ELECTRICAL SYSTEM ANALYSIS

PART 1 - GENERAL

1.01 SUBMITTALS

- A. Provide the following submittals, per Section 16010, for the electrical power system (all existing and new) from the 480V system down to and including the 208/120V distribution system:
 - 1. Short Circuit Study.
 - 2. Arc Flash Study.
- B. Short Circuit, and Arc Flash Studies shall be prepared, stamped and signed by a professional Electrical Engineer registered in the State of California and in accordance with IEEE 242, IEEE 399 ANSI/IEEE C37.13 and IEEE 519.
- C. Exceptions / Clarifications
 - 1. Itemize all exceptions and clarifications to the Contract Documents in a letter (located in the front of the submittal) on company letterhead.
 - 2. Exceptions that are noted in the study, but not listed on the Exceptions/Clarifications letter, will be considered as non-responsive and not accepted as changes to the Contract Documents.
 - 3. All exceptions taken from the Drawings and specifications shall be documented with justifications. When noting the exception, list which Drawings or which Specification Subsection number the exception is taken.
 - 4. Clarification requests shall list which Drawing or Specification Subsection number the clarification is required for.
- D. Clarification requests shall list which Drawing or Specification Subsection number the clarification is required for.
- E. Include copies of correspondence and data obtained from the Utility Company for fault data, X/R data from generator supplier, etc.

1.02 SEQUENCING AND SCHEDULING

- A. It is the responsibility of those performing the electrical system analysis to collect and field verify all data; including existing information. This includes

- obtaining all data from the serving Utility and generator manufacturer for this project.
- B. All studies shall be updated prior to Project Completion. Utilize characteristics of as-installed equipment and materials.
 - C. It is the Contractor's responsibility to obtain the required information from the Utility Company and vendors necessary for completing the required studies.
 - D. At the completion of the project, all studies shall be resubmitted with all calculations rerun, data and graphs updated to reflect as-left conditions. Provide new Arc Flash labels to reflect as-constructed equipment and as-left circuit breaker settings.

PART 2 - MATERIALS

2.01 GENERAL

- A. Equipment and component titles and numbers used in the Studies shall be identical to the equipment and component titles and numbers shown on the Drawings.
- B. Perform Studies using PC based computer software. State program name and version (e.g. version 2.1) in report.
- C. Perform complete fault calculations for Utility and generator sources. Equipment shall not be grouped as a single large load; they shall be treated as individual loads.
- D. Utilize proposed load data for the Study obtained from submittals, Utility Company and field verifications.
- E. It is the Contractor's responsibility to obtain the required information from the Utility Company, Generator supplier and vendors necessary for completing the requested studies.
- F. Contractor shall provide two sets of DVDs containing all of the electrical system analysis studies, including all SKM files or Contractor generated files used to develop the study for the Owner's use.
- G. Provide unique page numbers for every sheet in Study. Unique page numbers to be manually placed by Study Company after printout if study report doesn't assign page numbers.
- H. Provide one-line diagrams showing names of protective devices, buses, and branches. Buses shall have descriptive names (i.e. not Bus-0084).

2.02 SHORT CIRCUIT STUDY

- A. Include the following in the short circuit study:
 - 1. Cable impedances based on copper conductors.
 - 2. Bus impedances based on copper bus bars.
 - 3. Transformer impedances based on tolerances specified in ANSI C57.12.00.
 - 4. Source data (i.e. cable lengths, sizes, and quantity, for all runs in study, listing of bus loads, etc).

5. Utility data:
 - a. Size of Utility transformer.
 - b. Impedance of Utility transformer.
 - c. Primary voltage of Utility transformer.
 - d. Fault information on primary side of Utility transformer:
 - 1) Three phase bolted fault.
 - 2) X/R ratio (positive sequence).
 - 3) Line to ground fault.
 - 4) X/R ratio (zero sequence).
 - e. Protective relays (type & settings).
 6. Voltage drop and current flow at each node and load in system.
- B. Calculate Short Circuit interrupting duties for an assumed three-phase bolted fault and line-to-ground fault at each of the following locations:
1. Main Switchboard.
 2. All Motor Control Centers (MCCs).
 3. All panelboards
 4. All 480V, 3 phase motor and equipment loads
 5. All 3 phase transformer secondaries
 6. All 240/208V equipment
 7. Generator
- C. Verify:
1. Equipment and protective devices are applied within their ratings.
 2. Adequacy of switchboard, panelboard and MCC bus bars to withstand Short Circuit stresses.

3. Adequacy of transformer windings to withstand Short Circuit stresses and over-current.
 4. Cable sizes for ability to withstand normal and fault load currents.
- D. Provide the following in the Short Circuit study report:
1. Calculation methods and assumptions.
 2. Input data.
 3. Short circuit data.
 - a. Impedances.
 - b. X to R ratios.
 - c. Asymmetry factors.
 - d. Motor contributions.
 - e. Short Circuit kVA.
 - f. Symmetrical and asymmetrical line-to-line and line-to-ground fault currents.
 - g. Device evaluation including rating of equipment.
 - h. Bus evaluation including rating of equipment.
 - i. Source data, from Electric Utility Company.
 4. Tabulations of calculated quantities.
 5. Results, conclusions, and recommendations.
 6. One line diagram of distribution system
 7. Spreadsheet comparing the rating of the equipment and circuit breakers versus the calculated short circuit faults.
 8. Impedance diagram showing the resistances and reactances for all cables of the distribution system.
 9. Two studies (minimum) – one for worst case scenario and one for actual equipment operating.

10. Calculations for maximum and minimum contributions of fault current magnitude. The minimum calculation shall assume the minimum motor load. Conversely, the maximum calculation shall assume a maximum contribution from the Utility and shall assume motors to be operating under full-load conditions. The Study shall also calculate the fault current using in-rush current values.

2.03 ARC FLASH HAZARD STUDY

A. General:

1. Arc flash boundary and incident energy shall be calculated using a PC computer program at all significant locations in the electrical network, including switchgears, switchboards, MCCs, transformers, and other major equipment where work could be performed on energized equipment.
2. Arc flash computation shall include both line and load side of main breaker calculations, where necessary.
3. Document method of calculation.

B. Safe working distances shall be indicated or rated for calculated fault locations based upon the calculated arc flash boundary considering an incident energy of 1.2 cal/cm².

C. Study shall include the following:

1. All significant locations in 480 volt, 240 volt and 208 volt systems fed from transformers equal to or greater than 125 kVA.
2. Incident energy and arc flash protection boundary calculations in spreadsheet format in the Arc Flash Hazard study report.
3. Provide the following incident energy and flash protection boundary calculations in spreadsheet format in the Arc Flash Hazard study report (values shall be calculated for all electrical equipment in the power distribution system):
 - a. Arcing fault magnitude
 - b. Device clearing time
 - c. Duration of arc
 - d. Boundary for:
 - 1) Arc flash protection
 - 2) Limited shock approach
 - 3) Restricted shock approach
 - e. Working distance
 - f. Incident energy at 18 inches (in cal/sq-cm)

- g. Recommendations for arc flash energy reduction for each location having more than 8 cal/sq-cm. Provide preliminary cost estimate for implementing recommendations.
- h. List arc flash boundary in “inches” on label. No fractional distance in feet.
- 4. Provide recommendations for the Personal Protective Equipment (PPE) that the Owner should maintain on site.
- 5. Provide recommendations for safety label design that should be posted on electrical equipment.
- 6. Spreadsheet summarizing incident energy and flash protection boundary list Arc Flash Boundary in inches on label. No fractional distance in feet.

2.01 STUDY REPORTS

A. Written reports submitted for approval shall contain:

- 1. Scope of Studies performed.
- 2. Explanation of bus and branch numbering system.
- 3. Report calculations, tabulations and spreadsheets.
- 4. Selected equipment deficiencies.
- 5. Results of Short Circuit & Arc Flash Studies.
- 6. Comments, recommendations or suggestions regarding:
 - a. Changes and additions to equipment rating and/or characteristics.
 - b. Circuit protective devices improperly rated for overload or fault conditions.
 - c. Arc Flash protective equipment and safety labels.
- 7. Stamped, signed and dated by Electrical Engineer registered in the State of California who performed the analysis.

B. Reports are to be updated to reflect as-built conditions and placed in O&M manual, per Section 16010 requirements.

PART 3 – EXECUTION

3.01 GENERAL

- A. Make minor modifications to equipment settings as required to accomplish conformance with the Short Circuit and Arc Flash Studies.
- B. Notify Engineer in writing of any required major equipment modifications.
- C. Provide two (2) DVDs at the completion of the project. One DVD shall contain the as-built set of studies, reports, settings, and other pertinent information. The other DVD will contain the original source format of input data used for the PC based computer software. Provide all setup information used for the computer based study and report.

3.02 FIELD TESTS

- A. Provide field testing of protective equipment.
- B. Adjust relay and protective device settings according to values established by Coordination Study.

3.03 ARC FLASH WARNING LABELS

- A. All Arc Flash warning labels shall meet NEC requirements, OSHA standards and NFPA recommendations.
- B. Provide and install 3.5 in. x 5 in. thermal transfer type labels of high adhesion polyester for each work location analyzed and as required by the NEC for flash protection on power distribution equipment.
- C. Each label shall have an orange header with the wording, "WARNING, ARC FLASH HAZARD," and shall include the following machine printed information:
 - 1. Location designation
 - 2. Nominal System voltage
 - 3. Arc Flash boundary
 - 4. Available Incident energy and corresponding working distance (in inches)
 - 5. Minimum arc rating of clothing
 - 6. Site specific level of PPE
 - 7. Engineering report number, revision number and issue date
- D. Labels shall not be hand labeled.

- E. For all areas, Contractor shall post the following:
 - 1. Working distances
 - 2. Shock hazard voltage
 - 3. Shock Approach Boundaries:
 - a. Limited
 - b. Restricted
- F. Provide Arc Flash labels for the each of the following pieces of equipment:
 - 1. 480V, 240V and applicable 208V panelboards
 - 2. MCCs
 - 3. Switchboard
 - 4. Switchgears
 - 5. Control Panels
 - 6. Generator
 - 7. All electrical equipment with an incident energy level greater than 1.2 Cal/cm².
- G. Labels shall be submitted for approval. No labels shall be installed without prior approval by Owner or Owner representative.

3.04 ARC FLASH TRAINING

- A. The Supplier shall train Owner personnel of the potential arc flash hazards associated with working on energized equipment (minimum of 4 hours). Maintenance procedures shall be in accordance with the requirements of NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces and shall be provided in the equipment manuals.

END OF SECTION

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SECTION 16915
CONTROL STRATEGIES

PART 1 - GENERAL

1.01 CONTROL STRATEGIES - INDEX

CS #	Title
1	Fail to Start
2	Runtimes
3	Number of Starts
8	Station Alarm Light
9	Discrete Input Alarms
50	Level
91	Intrusion
100	Lift Pump Control 100 (& 200)
111~2	Lift Pump PMP111 111 (& 112 & 211 & 212)

PART 2 - MATERIALS

2.01 CONTROL STRATEGIES – GENERAL

- A. CS: #1
TITLE: Fail to Start

1. DESCRIPTION:

This strategy shall determine the typical fail to start alarms. This is a typical strategy for the following inputs:

P&ID #	PS	Call	Input	Alarm	Reset
I2	Giovanni	X111~2	N111~2	UAY111~2	HC100B
I3	Madrone	X211~2	N211~2	UAY211~2	HC200B

2. INPUTS / OUTPUTS:

LOGICAL INPUTS:

N111	-	Pump PMP111	Run/Off
HC100B	-	SCADA	Reset/Null
RB100	-	Giovanni Station	Reset/Null

LOGICAL OUTPUTS:

X111	-	Pump PMP111	Start / Stop
UAY111	-	Pump PMP111	Fail to Start/Norm
UAY111X	-	Pump PMP111	Lockout/Norm

VARIABLE INPUTS:

None

VARIABLE OUTPUTS:

None

SETPOINT REGISTERS:

SPT111N	-	Report Back Alarm Delay	Seconds

TIMERS:

K111N	-	Report Back Timer	Seconds

COUNTERS/TOTALIZERS:

None

3. CONTROL:

- a. None

4. TIMERS:

- a. See timers K111N, in Alarms.

5. CALCULATIONS:

- a. None

6. ALARMS:

- a. If Pump PMP111 is called to start X111,
AND run N111 is not on within SPT111N (timer K111N)
then activate Pump fail to start UAY111 alarm.
- b. If Pump fail to start UAY111 is active, set UAY111X Pump
Lockout.
The UAT111 shall be latched in upon being set until operator
manually resets via register Station Acknowledge RA100 OR
SCADA Reset HC100B.

- B. CS: #2
TITLE: Runtimes

1. DESCRIPTION:

This strategy shall determine the typical equipment runtimes. This is a typical strategy for the following inputs:

<u>P&ID #</u>	<u>PS</u>	<u>Input</u>	<u>Runtime</u>	<u>Runtime</u>	<u>Reset</u>
			<u>Non-Resetable</u>	<u>Resetable</u>	
I2	Giovanni	N111~2	K111~2K	K111~2L	R111~2R
I3	Madrone	N211~2	K211~2K	K211~2L	R211~2R

2. INPUTS / OUTPUTS:

LOGICAL INPUTS:

N111 - Pump PMP111 Run/Off
R111R - Pump PMP111 Total Runtime Reset/Null

LOGICAL OUTPUTS:

None

VARIABLE INPUTS:

None

VARIABLE OUTPUTS:

None

SETPOINT REGISTERS:

None

TIMERS:

K111K - Pmp PMP111 Rntim Non-Rst Hours
K111L - Pmp PMP111 Rntim Reset Hours

COUNTERS/TOTALIZERS:

None

3. CONTROL:

- a. None

4. TIMERS:

- a. See timers K111K, K111L, in Calculations.

5. CALCULATIONS:

- a. K111K - Pump PMP111 Total Run Time is the total accumulated time the Pump has run – non – resettable (elapsed time N111 was active).
- b. K111L - Pump PMP111 Total Run Time is the total accumulated time the Pump has run since the value was manually reset by the operator R111R (elapsed time N111 was active since last reset).

6. ALARMS:

- a. None

- D. CS: #3
TITLE: Number of Starts

1. DESCRIPTION:

This strategy shall determine the number of pump starts. This is a typical strategy for the following inputs:

<u>P&ID #</u>	<u>PS</u>	<u>Input</u>	<u>Pump Starts</u> <u>Non-Resettable</u>	<u>Pump</u> <u>Starts</u> <u>Resettable</u>	<u>Reset</u>
I2	Giovanni	N111~2	Q111~2N	Q111~2P	R111~2S
I3	Madrone	N211~2	Q211~2N	Q211~2P	R211~2S

2. INPUTS / OUTPUTS:

LOGICAL INPUTS:

N111	-	Pump PMP111	Run/Off
R111S	-	Pump PMP111 # of Starts	Reset/Null

LOGICAL OUTPUTS:

None

VARIABLE INPUTS:

None

VARIABLE OUTPUTS:

None

SETPOINT REGISTERS:

None

TIMERS:

Q111N	-	Pmp PMP111 Starts Non-Rst	Hours
Q111P	-	Pmp PMP111 Starts Reset	Hours

COUNTERS/TOTALIZERS:

None

3. CONTROL:

- a. None

4. TIMERS:

- a. See timers Q111N, Q111P, in Calculations.

5. CALCULATIONS:

- a. Q111N - Pump 1 Non-Resettable Starts is the total accumulated number of Pump starts – non – resettable (number of times N111 went active).
- b. Q111P - Pump 1 Resettable Starts is the total accumulated number of the Pump starts since the value was manually reset by the operator R111S (number of times N111 went active since last reset).

6. ALARMS:

- a. None

- F. CS: #8
TITLE: Station Alarm Light

1. DESCRIPTION:

This strategy shall determine the typical station alarm light. This is a typical strategy for the following:

<u>P&ID #</u>	<u>Alarm Input</u>	<u>Station Light</u>	<u>Station Alarm</u>	<u>Station Ack</u>	<u>SCADA Ack</u>
I2	All Alarms and Lockouts	UA100Y	UAY100	RA100	HC100B
I3	All Alarms and Lockouts	UA200Y	UAY200	RA200	HC200B

2. INPUTS / OUTPUTS:

LOGICAL INPUTS:

HC100B	-	SCADA	Acknowledge/Null
RA100	-	Station	Acknowledge/Null

LOGICAL OUTPUTS:

USY100	-	Alarm Light	On/Off
UAY100	-	General Station Alarm	Active/Null

VARIABLE INPUTS:

None

VARIABLE OUTPUTS:

None

SETPOINT REGISTERS:

None

TIMERS:

None

COUNTERS/TOTALIZERS:

None

3. CONTROL:

- a. See Alarms for acknowledge routine.

4. TIMERS:

- a. See Alarms for K100F.

5. CALCULATIONS:

- a. None

6. ALARMS:

- a. If there is a new Alarm
then set USY100 Station Alarm Light to flashing
AND set UAY100 General Station Alarm
- b. The USY100 shall remain flashing until operator manually
acknowledges Alarm via register Acknowledge RA100 **OR**
SCADA Acknowledge HC100B.
- c. Alarm Light USY100 shall be latched in solid and UAY100
shall be latched in until all alarm inputs have cleared.

G. CS: #9
TITLE: Discrete Input Alarms

1. DESCRIPTION:

This strategy shall determine the typical discrete input alarms. This is a typical strategy for the following inputs:

P&ID#	PS	Input	Enable/disabl	Alarm
I2	Giovanni	UST111~2	U111~2T	UAT111~2
I2	Giovanni	LSHH151	U151HH	LAHH151
I2	Giovanni	LSLL151	U151LL	LALL151
I2	Giovanni	UST198	U198T	UAT198
I2	Giovanni	ESL199	U199L	EAL199
I3	Madrone	UST211~2	U211~2T	UAT211~2
I3	Madrone	LSHH251	U251HH	LAHH251
I3	Madrone	LSLL251	U251LL	LALL251
I3	Madrone	UST298	U298T	UAT298
I3	Madrone	ESL299	U299L	EAL299

2. INPUTS / OUTPUTS:

LOGICAL INPUTS:

UST111	-	Pump PMP111 Fail	Alarm/Normal
U111T	-	Pump PMP111 Fail	Enable/Disable

LOGICAL OUTPUTS:

UAT111	-	Pump PMP111 Fail	Alarm/Ok

VARIABLE INPUTS:

None

VARIABLE OUTPUTS:

None

SETPOINT REGISTERS:

SPT111T	-	Pump PMP111 Fail Dly	Seconds

TIMERS:

K111T	-	Pump PMP111 Fail Timer	Seconds

COUNTERS/TOTALIZERS:

None

3. CONTROL:

a. See CS#8 for acknowledge routine.

4. TIMERS:
 - a. See timers K111T, in Alarms.
5. CALCULATIONS:
 - a. None.
6. ALARMS:
 - a. If UST111 indicates Pump PMP111 Fail for the duration of alarm delay SPT111T (timer K111T), **AND** switch U111T is enabled; then post UAT111 Pump PMP111 Fail alarm.

H. CS: #50
TITLE: Level

1. DESCRIPTION:

This strategy shall determine the typical Level readout and alarms. This is a typical strategy for the following inputs:

P&ID#	PS	Input	Alarm
I2	Giovanni	L151	LAH151, LAHL151 LAL151
I3	Madrone	L251	LAH251, LAHL251 LAL251

2. INPUTS / OUTPUTS:

LOGICAL INPUTS:

U151H	-	Giovanni Wetwell High Alarm	Enable/Disable
U151HL	-	Giovanni Wetwell Xdcr Alarm	Enable/Disable
U151L	-	Giovanni Wetwell Low Alarm	Enable/Disable

LOGICAL OUTPUTS:

LAH151	-	Giovanni Wetwell High Level	Alarm/Ok
LAHL151	-	Giovanni Wetwell Xdcr	Alarm/Ok
LAL151	-	Giovanni Wetwell Low Level	Alarm/Ok

VARIABLE INPUTS:

L151	-	Giovanni Wetwell Level	Feet

VARIABLE OUTPUTS:

None

SETPOINT REGISTERS:

SP151HH	-	Giovanni WW Hi Xdcr Alm	Feet
SP151H	-	Giovanni WW High Level Alm	Feet
SP151L	-	Giovanni WW Low Level Alm	Feet
SP151LL	-	Giovanni WW Lo Xdcr Alm	Feet
SPT151H	-	Giovanni WW High Lvl Delay	Seconds
SPT151HL	-	Giovanni WW Xdcr Delay	Seconds
SPT151L	-	Giovanni WW Low Lvl Delay	Seconds

TIMERS:

K151H	-	Giovanni WW High Lvl Timer	Seconds
K151HL	-	Giovanni WW Xdcr Timer	Seconds
K151L	-	Giovanni WW Low Lvl Timer	Seconds

3. CONTROL:
 - a. See CS#8 for acknowledge routine.
4. TIMERS:
 - a. See timers K151H, K151HL, K151L, in Alarms.
5. CALCULATIONS:
 - a. None.
6. ALARMS:
 - a. If Giovanni Wetwell Level L151 is greater than High setpoint SP151H
for the duration of alarm delay SPT151H (timer K151H),
AND switch U151H is enabled;
then post LAH151 Giovanni Wetwell High Level alarm.
 - b. If Giovanni Wetwell Level L151 is less than Low setpoint SP151L
for the duration of alarm delay SPT151L (timer K151L),
AND switch U151L is enabled;
then post LAL151 Giovanni Wetwell Low Level alarm.
 - c. If Giovanni Wetwell Level L151 is greater than High Transducer setpoint SP151HH
OR Giovanni Wetwell Level L151 is less than Low Transducer setpoint SP151LL
for the duration of alarm delay SPT151HL (timer K151HL),
AND switch U151HL is enabled;
then post LAHL151 Giovanni Wetwell Transducer Fail alarm.

- J. CS: #91
TITLE: Intrusion

1. DESCRIPTION:

This strategy shall determine the intrusion alarms. This is a typical strategy for the following instruments:

<u>P&ID</u>	<u>STATION</u>	<u>INPUT</u>	<u>BYPASS</u>	<u>ALARM</u>
I2	Giovanni	ZS191A	Y191	ZAT191
I3	Madrone	ZS291A	Y291	ZAT291

2. INPUTS & OUTPUTS:

LOGICAL INPUTS:

HC100B	-	SCADA – PLC-100	Ack / Null
RA100	-	PLC-100	Ack / Null
U191Z	-	Intrusion Alarm	Enable / Disable
ZSH191	-	Intrusion Alarm	Alarm / Normal
Y191	-	Intrusion Bypass	Bypass / Normal

LOGICAL OUTPUTS:

ZAT191	-	Intrusion Alarm	Alarm/Null

VARIABLE INPUTS:

None

VARIABLE OUTPUTS:

None

SETPOINT REGISTERS:

SPT191T	-	Intrusion Alarm Delay	Seconds

TIMERS:

K191T	-	Intrusion Timer	Seconds

COUNTERS/TOTALIZERS:

None

3. CONTROL:

- a. None

4. TIMERS:

- a. See timer K191T, in part 6 Alarms.

5. CALCULATIONS:

- a. None

6. ALARMS:

- a. If Intrusion has been activated as indicated by ZSH191 (input is latched),
AND Intrusion Bypass Y191 is NOT Bypass within alarm delay SPT191T (timer K191T),
AND switch U191Z is enabled;
then activate Panel Intrusion ZAT191 alarm.
- b. The ZAT191 shall be latched in upon being set until operator manually reset via register Alarm Ack RA100 or via register HC100B.

2.02 CONTROL STRATEGIES – SPECIFIC

- A. CS: #100 (& 200)
TITLE: Pump Station Control

1. DESCRIPTION:

This strategy shall determine the sequence of which physical Lift pumps are called in response to the wetwell level. The 1st Stage pump is enabled and disabled (SA100) by Level start/stop setpoints. The 2nd Stage pump will be enabled and disabled (SB110) by Level start/stop setpoints.

<u>P&ID#</u>	<u>RTU</u>	<u>Tag #</u>	<u>Wetwell</u>
I2	Giovanni	110	L151
I3	Madrone	210	L251

2. INPUTS/OUTPUTS:

LOGICAL INPUTS:

None

LOGICAL OUTPUTS:

S110A	- 1st Pump in Sequence	En/Dis
S110B	- 2nd Pump in Sequence	En/Dis
XU111	- PMP111 Call	En/Dis
XU112	- PMP112 Call	En/Dis

VARIABLE INPUTS:

L151	- Wetwell Level	FT

VARIABLE OUTPUTS:

None

SETPOINT REGISTERS:

SP110	- Pump Mode	Code #
SP110S	- 1st Stage Pump Start	FT
SP110T	- 1st Stage Pump Stop	FT
SP110U	- 2nd Stage Pump Start	FT
SP110V	- 2nd Stage Pump Stop	FT
SPT10S	- 1st Stage Pump Start Dly	Seconds
SPT110T	- 1st Stage Pump Stop Dly	Seconds
SPT10U	- 2nd Stage Pump Start Dly	Seconds
SPT110V	- 2nd Stage Pump Stop Dly	Seconds

TIMERS:

K110S	-	1st Stage Pump Start Dly	Seconds
K110T	-	1st Stage Pump Stop Dly	Seconds
K110U	-	2nd Stage Pump Start Dly	Seconds
K110V	-	2nd Stage Pump Stop Dly	Seconds

COUNTERS/TOTALIZERS:

None

3. CONTROL:

The following (part a, b) is a typical control for the switch SA110. All switches (S110A, S110B) set/reset shall follow S110A format:

- a. If L151 is below 1st stage pump start SP110S for the duration of start delay SPT110S (timer K110S); then set 1st stage switch S110A.
- b. If L151 is above 1st stage pump stop SP110T for the duration of stop delay SPT110T (timer K110T); then reset 1st stage switch S110A.
- c. The sequence of the order for pumps to be called shall be per the code number set in register SP110. When a new code number is set in register SP110 the sequence shall be changed per the following definitions:

CODE SET IN SP110	PUMP CALL SEQUENCE	
	CODE LOGICAL OUTPUT	
	Pump 1	Pump 2
	Call XU111	Call XU112
	<u>Assignment to</u>	<u>Assignment to</u>
0	Rotate	
1	S110A	S110B
2	S110B	S110A

4. TIMERS:

- a. See timers K110S, K110T, K110U, K110V, in part 3 Control.

5. CALCULATIONS:

- a. None.

6. ALARMS:

- a. None.

B. P&ID: I2
 CS: #111 (& #112 & #211 & #212)
 LOCATION: Pump Station
 TITLE: Pump PMP111 (& PMP112 & PMP211 & PMP212)

1. DESCRIPTION:

These strategies control the automatic physical starting and stopping of the Lift Pumps. (Typical for PMP211 & PMP212)

<u>CS #</u>	<u>EQUIP #</u>	<u>Tag #</u>
111	PMP111	111
112	PMP112	112

2. INPUTS / OUTPUTS:

LOGICAL INPUTS:

N111~2	-	PMP111~2 Operation	Run/Off
XU111	-	PMP111 Call	En/Dis
UAT111	-	PMP111 Fail	Active/Norm
Y111	-	PMP111 Status	Auto /Not Auto
YC111	-	PMP111 SCADA Ctrl	SCADA/PLC
YH111	-	PMP111 SCADA Man	On/Off

LOGICAL OUTPUTS:

X111	-	PMP111 Call	Start/Stop

VARIABLE INPUTS:

Non

VARIABLE OUTPUTS:

Non

SETPOINT REGISTERS:

SPT110M	-	Pumps Start Seq Dly	Seconds

TIMERS:

K110M	-	Pumps Start Seq Dly	Seconds

COUNTERS/TOTALIZERS:

None

3. CONTROL:

- a. HS111B - HAND Position
Hand control operates the equipment independent of the PLC.
- b. HS111B - OFF Position
Off stops the equipment independent of the PLC.
- c. HS111B - AUTO Position
 - 1) If the switch (HS111B) status Y111 is in Auto position,
AND SCADA Control status YC111 is in PLC position,
AND Pump Fail UAT111 is normal,
AND call XU111 has been Enabled;
then set X111 to Start Pump.
 - 2) If the switch (HS111B) status Y111 is in Auto position,
AND SCADA Control status YC111 is in SCADA position,
AND Pump Fail UAT111 is normal,
then upon receipt of SCADA in Manual mode YH111 set X111 to Start Pump.
 - 3) If SCADA Control status YC111 is in PLC position,
AND Pump PMP111 status Y111 is in Not Auto position,
OR Pump Fail UAT111 is active;
OR Pump call XU111 has been removed;
then reset X111 to Stop Pump.
 - 4) If SCADA Control status YC111 is in SCADA position,
AND Pump PMP111 status Y111 is in Not Auto position,
OR Pump Fail UAT111 is active;
OR SCADA in Manual mode YH111 is OFF;
then reset X111 to Stop Pump.

4. TIMERS:

- a. If a Pump is started as indicated by N111 **OR** N112;
then clear the timer K110M to restart sequential time delay.
Pumps shall be sequentially restarted with the SPT110M time delay before the first Pump is started or when PLC is placed in RUN mode and between each Pump called thereafter.

5. CALCULATIONS:

a. None.

6. ALARMS:

a. None.

END OF SECTION