Contract Documents
for
Construction of

JO-LIN SEWER LIFT STATION REHABILITATION

JANUARY 2016

Bid Proposals must be received no later than 2:00 p.m. MARCH 1, 2016
City of Los Banos City Clerk
520 J Street
Los Banos, CA 93635

City of Los Banos
Public Works Department

Table of Contents

Advertisement for Bids

CITY OF LOS BANOS
520 J Street
Los Banos, California 93635

Notice is hereby given that separate sealed bids for the award of contract for the **Construction of Jo-Lin Sewer Lift Station Rehabilitation** will be received by the City of Los Banos at the office of the City Clerk until 2:00 p.m. Pacific Standard Time, March 1, 2016 and then at said office publicly opened and read aloud.

The major WORK consists of the rehabilitation of an existing sanitary sewer lift station located at 2088 Greenbriar Drive, in the City of Los Banos. Improvements will include the removal of existing electrical controls and conduit, lift station pumps and appurtenances; the installation of submersible pumps and appurtenances, onsite piping, electrical service and motor control center, reconfiguration of existing wet well bottom, installation of protective lining to existing wet well, temporary sewer bypass pumping as required and removal and replacement of curb, gutter, sidewalk and asphalt above proposed underground improvements.

The time for completion shall be One Hundred Ten (110) working days from Owner's Notice to Proceed.

The Contract Documents, in their entirety, can be viewed and/or obtained from the City of Los Banos website at www.losbanos.org or at the following locations:

Central California Builders Exchange, 1244 N. Mariposa, Fresno, CA 93703 (www.cencalbx.com)

Builders Exchange of Stockton, 7500 N. West Lane, Stockton, CA 95210 (www.besonline.com)

Valley Builders Exchange, Inc., 1118 Kansas Avenue, Modesto, CA 95351 (www.valleybx.com)

Builders Exchange of Merced/Mariposa, 415 West 18th Street, Ste. 7, Merced, CA 95340 (www.bxmm.org)

Dodge Data & Analytics 1-800-393-6343 (www.construction.com/plans/)

A payment bond prepared and executed in accordance with California Civil Code Section 3247 and a bond for faithful performance of the contract will be required of the successful bidder who is awarded the contract.

The successful Bidder must comply with the latest general prevailing rate of per diem wages as determined by the Director of Industrial Relations, State of California, Department of Industrial Relations and is to be paid to the various craftsmen and laborers required to construct said improvements and is made a part of the Specifications and Contract for said work to which reference is hereby made for further particulars.

No contractor or subcontractor may be listed on a bid proposal or awarded a contract for public work on a public works project unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5.

This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations. Contractor Registration Information can be found at:

http://www.dir.ca.gov/Public-Works/PublicWorks.html

Each Bid shall be accompanied by cashier's or certified check or by a bidder's bond, made payable to the City of Los Banos and executed by a corporate surety licensed to issue surety bonds in the State of California, for an amount equal to at least ten percent (10%) of the amount of said bid and no bid shall be considered unless such cashier's or certified check or bidder's bond is enclosed therewith.

The successful bidder of this project shall have the following current and active California State Contractor's License at the time of the submission of the Bid and throughout the duration of the contract: **Class A**.

The lift station will be opened for examination by prospective Bidders between 10 a.m. and 11 a.m. on Thursday, February 11, 2016.

Bidders shall refer to the Contract Document's Information for Bidders for complete instructions.

Bidders are solely responsible for the cost of preparing their Bids.

The City specifically reserves the right, in its sole discretion, to reject any or all Bids, to re-bid, or to waive inconsequential defects, in bidding not involving time, or quality of the work. The City may reject any and all Bids and waive any minor irregularities in the Bids.

Information for Bidders

Sealed BIDS will be received by the City of Los Banos (herein called the "OWNER"), at the office of the City Clerk until 2:00 p.m. Pacific Standard Time (PST), on March 1, 2016, then at said office, publicly opened and read aloud. OWNER shall reject all BIDS received after the specified time and will return such BIDS to BIDDER, unopened. BIDDERS must submit BIDS in accordance with these instructions. No emailed or faxed BIDS will be accepted.

The major WORK consists of the rehabilitation of an existing sanitary sewer lift station located at 2088 Greenbriar Drive; in the City of Los Banos. Improvements will include the removal of existing electrical controls and conduit, lift station pumps and appurtenances; the installation of submersible pumps and appurtenances, onsite piping, electrical service and motor control center, reconfiguration of existing wet well bottom, installation of protective lining to existing wet well, temporary sewer bypass pumping as required and removal and replacement of curb, gutter, sidewalk and asphalt above proposed underground improvements. The time for completion is One Hundred Ten (110) working days.

Each BID must be submitted in a sealed envelope and addressed to the City of Los Banos at 520 J Street, Los Banos, CA 93635. Each sealed envelope containing a BID must be plainly marked on the outside as "**JO-LIN SEWER LIFT STATION REHABILITATION: Attention City Clerk**", and the envelope shall also bear on the outside, the name of the CONTRACTOR, and their address. If forwarded by mail, the sealed envelope containing the BID must be enclosed in another envelope addressed to the City of Los Banos at 520 J Street, Los Banos, CA, 93635, and also clearly state, "**JO-LIN SEWER LIFT STATION REHABILITATION: Attention City Clerk**".

A complete BID includes the Bid Form, List of Subcontractors, Equal Employment Opportunity, Non-Collusion Affidavit, Debarment and Suspension Certification, Bid Schedule, Experience, Bid Bond with surety, and a copy of a current Contractor's License in the State of California. A signed Addendum, if issued, must also be submitted with the sealed BID. The Total Bid Amount must be filled in, in ink or typewritten, and the BID must be fully completed and executed when submitted. Only one set of original BID forms are required to be submitted. Mistakes must be corrected and the correction inserted; correction must be initialed in ink by person or persons signing the BID. No conditional BIDs will be accepted.

The BID shall be signed by a person or persons legally authorized to bind BIDDER to the Contract. The individual or individuals signing each document shall warrant that they are authorized to bind the BIDDER.

The OWNER may waive any informalities or minor defects or reject any and all BIDS. Any BID may be withdrawn prior to the above scheduled time for the opening of BIDS or authorized postponement thereof. Any BID received after the time and date specified shall not be considered. No BIDDER may withdraw a BID within 30 days after the actual date of the opening thereof. Should there be reasons why the Contract cannot be awarded within the specified period, the time may be extended by mutual agreement between the OWNER and the BIDDER.

Each BID must be accompanied by a BID BOND payable to the OWNER for ten percent (10%) of the total amount of the BID. As soon as the BID amounts have been compared, the OWNER will return the bid security of all except the three lowest responsive and responsible BIDDERS. Once a CONTRACTORS BID has been awarded, and the PAYMENT BOND and PERFORMANCE BOND of the successful CONTRACTOR has been received by the OWNER, the bid security of the three remaining lowest responsive and responsible BIDDERS will be returned.

All bonds must be acknowledged before a Notary Public by both the CONTRACTOR and the Surety. Attorneys-in-fact who sign Bid Bonds or Payment Bonds and Performance Bonds must file with each bond a certified and effective dated copy of their power of attorney.

Award and Execution of Contract

The party to whom the Contract is awarded will be required to execute the AGREEMENT, and obtain the PERFORMANCE BOND and PAYMENT BOND along with satisfactory evidence of insurance within ten (10) calendar days from the date when the NOTICE OF AWARD is delivered to the BIDDER. The NOTICE OF AWARD shall be accompanied by the necessary AGREEMENT and BOND forms. In case of failure of the BIDDER to execute the AGREEMENT, the OWNER may, at his option, consider the BIDDER in default, in which case the BID BOND accompanying the BID shall become the property of the OWNER.

A PERFORMANCE BOND and a PAYMENT BOND, each in the amount of 100 percent of the CONTRACT PRICE, with a corporate surety named on the current list of “Surety Companies Acceptable on Federal Bonds” as published in the Treasury Department Circular Number 570, will be required for the faithful performance of the Contract. The PAYMENT BOND must be issued by an admitted surety insurer holding a certificate of authority to transact surety insurance in California issued by the Insurance Commissioner.

All bonds must be acknowledged before a Notary Public by both the CONTRACTOR and the Surety. Attorneys-in-fact who sign Bid Bonds or Payment Bonds and Performance Bonds must file with each bond a certified and effective dated copy of their power of attorney.

The OWNER, within 15 days of receipt of the PERFORMANCE BOND, PAYMENT BOND and AGREEMENT signed by the party to whom the Contract was awarded, shall sign the AGREEMENT and return to such party an executed duplicate of the AGREEMENT. Should the OWNER not execute the AGREEMENT within such period, the BIDDER may, by written notice, withdraw his signed AGREEMENT. Such notice of withdrawal shall be effective upon receipt of the notice by the OWNER.

The NOTICE TO PROCEED shall be issued within 10 days of the execution of the AGREEMENT by the OWNER. Should there be reasons why the NOTICE TO PROCEED has not been issued within such period, the time may be extended by mutually agreed upon, and the CONTRACTOR may terminate the AGREEMENT without further liability on the part of either party.

All applicable laws, ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the PROJECT shall apply to the Contract throughout.

Subcontractors

The SUBCONTRACTORS listed by CONTRACTOR in the BID shall list therein the name and address of each SUBCONTRACTOR to whom the CONTRACTOR proposes to subcontract portions of the WORK in an amount in excess of one-half of one percent of the total BID or $10,000, whichever is greater, in accordance with the Subletting and Subcontracting Fair Practices Act, commencing with Section 4100 of the Public Contract Code. The CONTRACTOR’S attention is invited to other provisions of the Act related to the imposition of penalties for a failure to observe its provisions by using unauthorized SUBCONTRACTORS or by making unauthorized substitutions.

Registration with California Department of Industrial Relations (DIR)

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 chapter, unless currently registered and qualified to perform public work pursuant to Section 1725.5. It is not a violation of this section for an unregistered contractor to submit a bid that is authorized by Section 7029.1 of the business and Professions Code or by Section 10164 or 20103.5 of the Public Contract Code, provided the CONTRACTOR is registered to perform public work pursuant to Section 1725.5 at the time the CONTRACT is awarded. Labor Code Section 1771.1(a) requires CONTRACTORS and their SUBCONTRACTORS to possess and maintain such registration with DIR in order to be awarded and to perform on public works projects (regardless of funding source).

Pursuant to Section 1771.4, each CONTRACTOR and SUBCONTRACTOR shall furnish certified payroll records to the Labor Commissioner at least monthly and in a format prescribed by the Labor Commissioner of the DIR. Until such time that the DIR gives awarding agencies direct access to all certified payrolls submitted by CONTRACTORS and SUBCONTRACTORS, CONTRACTOR and his

SUBCONTRACTORS are also required to submit copies of payroll records to OWNER on a monthly basis. Information on the above can be found at:

http://www.dir.ca.gov/Public-Works/PublicWorks.html

Prevailing Wage

This WORK is subject to prevailing wage requirements. If there is a difference between the minimum wage rates predetermined by the Secretary of Labor and the prevailing wage rates determined by the Director of the Department of Industrial Relations of the State of California for similar classification of labor, the CONTRACTOR and his SUBCONTRACTOR shall not pay less than the higher wage rate. In accordance with the provisions of Section 1773 of the Labor Code of the State of California, the OWNER has obtained from the Director of the Department of Industrial Relations, the general prevailing rate for each craft, classification, or type of workman required for execution of the AGREEMENT. A copy of said prevailing rate of per diem wages is on file in the office of the OWNER, and available from the California Department of Industrial Relations' Internet web site at **http://www.dir.ca.gov/DLSR/PWD**.

The Federal minimum wage rates for this WORK as predetermined by the United States Secretary of Labor may be examined at the offices described above where the Provisions may be seen. Addenda to modify the Federal minimum wage rates, if necessary, will be posted on the internet at **www.losbanos.org**. Future effective general prevailing wage rates, which have been predetermined are on file with the California Department of Industrial Relations and are referenced but not printed in the general prevailing wage rates.

Pre-Bid Site Review

The lift station will be opened for examination by prospective Bidders between 10 a.m. and 11 a.m. on Thursday, February 11, 2016.

BIDDERS must satisfy themselves as to the accuracy of the estimated quantities in the Bid Schedule by examination of the site and a review of the DRAWINGS and SPECIFICATIONS including ADDENDA. After BIDS have been submitted, the BIDDER shall not assert that there was misunderstanding concerning the quantities of WORK or the nature of the WORK to be done. The failure or omission of any BIDDER to do any of the foregoing shall not relieve any BIDDER from any obligation with respect to his BID.

The CONTRACT DOCUMENTS contain the provisions required for the construction of the PROJECT. The Owner will not be responsible for, nor be bound by, any oral instructions, interpretations, or explanations issued by the Owner or its representatives. Any request for clarifications or questions of the CONTRACT DOCUMENTS shall be made in writing or email and deliverable to:

City of Los Banos Public Works Department
Attn: Royal Lloyd
royal.lloyd@losbanos.org
411 Madison Avenue
Los Banos, CA 93635

Written requests for clarification or questions shall be delivered to the OWNER before 5:00 p.m. PST on February 17, 2016. Any OWNER response to a request for clarification, questions and answers will be posted to the City's website at www.losbanos.org no later than 5:00 p.m. PST on February 19, 2016 and if necessary, shall become a part of the BID as an ADDENDUM.

Proposed timeline of events associated with the awarding of BID:

Release of Advertisement for Bid		Friday, January 29, 2016
On Site Review	10 - 11 a.m.	Thursday, February 11, 2016
Deadline to Submit Questions/Clarifications	5:00 p.m.	Wednesday, February 17, 2016
Addendum/Questions/Clarifications posted	5:00 p.m.	Friday, February 19, 2016
Bid Opening	2:00 p.m.	Tuesday, March 1, 2016

City Council Considers Bid		Wednesday, April 6, 2016 (tentative)
Issuance of a Notice to Proceed	On or before:	Friday, April 22, 2016 (tentative)
Construction to Begin	On or before:	Monday, May 9, 2016 (tentative)

Qualification of Bidder

The OWNER may make such investigation as it deems necessary to determine the ability of the BIDDER to provide the services requested, and the BIDDER shall furnish to the OWNER all information and data for this purpose as the OWNER may request. The OWNER reserves the right to reject any BID should the evidence submitted by, or investigation of, the BIDDER fail to satisfy the OWNER that such BIDDER is properly qualified to carry out the obligations of the BID and to complete the requirements contemplated therein.

Governing Law and Venue

This BID, or any Contract that may result from the award of this BID, shall be deemed to be made under, and shall be governed by and construed in accordance with, the laws of the State of California. Any action brought to enforce the terms, or provision of this BID or any Contract that may result from the award of this BID, shall have venue in the County of Merced, State of California.

Mandatory BID Protest Procedure

The lack of prompt procedure to resolve disputes regarding the bidding process would impair the OWNER'S ability to carry out its purpose of contracting this project in a timely manner. Therefore, to the maximum extent authorized by law and notwithstanding any other procedures specified in these CONTRACT DOCUMENTS, all disputes and/or protests regarding the bidding process shall be subject to the following procedure. In submitting a BID to the OWNER for this WORK, the BIDDER agrees to comply with and to be bound by this procedure.

Any bid protest must be submitted in writing to the OWNER before 5:00 p.m. on the fifth (5^{th}) business day following bid opening.

1. The initial protest document must contain a complete statement of the basis for the protest, and all supporting documentation. A non-refundable fee of One Thousand Dollars ($1,000.00) made payable to the "City of Los Banos" shall accompany the protest documents and will be used by the OWNER to recover costs in evaluating the bid protest. A bid protest submitted without the requisite fee shall not be considered by the OWNER.
2. 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. Only BIDDERS who the OWNER otherwise determines are responsive and responsible are eligible to protest a BID.
3. A party may not rely on the bid protest submitted by another BIDDER, but must timely pursue its own protest.
4. The protest must refer to the specific portion of the CONTRACT DOCUMENTS which forms the basis for the protest.
5. The protest must include the name, address and telephone number of the person representing the protesting party.
6. 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.
7. The OWNER will give the protested BIDDER five (5) business 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 the delivery to the OWNER.

8. The procedure and time limits set forth in this paragraph are mandatory and are the BIDDERS sole and exclusive remedy in the event of bid protest. The BIDDERS 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.

If the OWNER determines that a protest is frivolous, the protesting BIDDER may be determined to be non-responsive and/or non-responsible and that BIDDER may be determined to be ineligible for future contract awards.

Cancellation of Contract

The OWNER may terminate any Contract derived from this BID as follows:

- WITHOUT CAUSE at any time by giving thirty (30) calendar days written notice to the successful CONTRACTOR;
- WITH CAUSE (Default) at any time by giving ten (10) calendar days written notice to the successful CONTRACTOR. Cancellation for cause shall be at the discretion of the OWNER and shall be, but is not limited to, failure to supply the items, materials, equipment or services specified within the time allowed or within the terms, conditions or provisions of this BID. The successful CONTRACTOR may not cancel any contract derived from this BID, without prior written consent of the OWNER.

Bid Form

TO: City of Los Banos
520 J Street
Los Banos, CA 93635

In compliance with the Invitation for Sealed Bids the undersigned, as BIDDER, hereby offers to provide to the OWNER, in accordance with the terms and conditions in the Provisions set forth in the CONTRACT DOCUMENTS the stated total bid amount quoted on this Bid Form for the WORK of

JO-LIN SEWER LIFT STATION REHABILITATION

Total Bid Amount: $________________________

____
(Total Bid Amount in Written Form)

The undersigned certifies under penalty of perjury under the laws of the State of California and the United States of America, that the above quotation constitutes a bona-fide offer for the WORK, that undersigned is a duly authorized representative of the company listed, that the quotation is in no way sham or collusive, and that the executed AGREEMENT between the CONTRACTOR and OWNER constitutes acceptance of CONTRACTOR'S total bid for the WORK stated in the CONTRACT DOCUMENTS. The undersigned has read the General Provisions, Special Provisions, and Technical Specifications in these CONTRACT DOCUMENTS. The undersigned further certifies, under penalty of perjury that the Non-Collusion Affidavit required by Title 23 United States Code, Section 112 and Public Contract Code Section 7106; and the Title 49 Code of Federal Regulations, Part 29 Debarment and Suspension Certification are true and correct.

The undersigned acknowledges receipt of the following addenda: __________________________

____

Signature: ________________________________ Date: ________________________________

Title: ________________________________

Name of Business: ____

Doing business as: (*Circle One*): An Individual A Partnership A Corporation

Business Address: ____

Telephone No.: ____________________________ Fax No.: ____________________________

E-Mail Address: ____

License Number: ____________________ Class & Expiration Date: _________________________

List of Subcontractors

The BIDDER shall herein set forth the name and location of the place of business of each SUBCONTRACTOR who will perform work or labor or render services to the CONTRACTOR in or about the construction of the WORK in an amount in excess of one-half of one percent of the CONTRACTOR'S total BID, and the portion of the WORK which will be done by each SUBCONTRACTOR (see item 34 of the General Provisions). Attach additional sheets, if necessary.

Project: **JO-LIN SEWER LIFT STATION REHABILITATION**

The following WORK will be performed (or provided) by the following SUBCONTRACTORs, and coordinated by CONTRACTOR:

Company Name	Address	License No.	Section of Work

Equal Employment Opportunity

CONTRACTOR hereby certifies that CONTRACTOR and SUBCONTRACTORs

☐ Have
☐ Have Not

participated in a previous contract or subcontract subject to the equal opportunity clauses, as required by Executive Orders 10925, 11114, or 11246, and that, where required, have filed with the Joint Reporting Committee, the Director of the Office of Federal Contract Compliance, a Federal Government contracting or administering agency, or the former President's Committee on Equal Employment Opportunity, all reports due under the applicable filing requirements.

Note: The above certification is part of the BID. Signing this BID on the signature portion thereof shall also constitute signature of these Certifications.

Non-Collusion Affidavit

PUBLIC CONTRACT CODE 7106

In conformance with Title 23 United States Code Section 112 and Public Contract Code 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 bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract 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.

Debarment and Suspension Certification

TITLE 49, CODE OF FEDERAL REGULATIONS, PART 29

The Contractor, under penalty of perjury, certifies that, except as noted below, he/she or any other person associated therewith in the capacity of owner, partner, director, officer, and manager:

- Is not currently under suspension, debarment, voluntary exclusion, or determination of ineligibility by any federal agency;
- Has not been suspended, debarred, voluntarily excluded or determined ineligible by any federal agency within the past 3 years;
- Does not have a proposed debarment pending; and
- Has not been indicted, convicted, or had a civil judgment rendered against it by a court of competent jurisdiction in any matter involving fraud or official misconduct within the past 3 years.

If there are any exceptions to this certification, insert the exceptions in the following space.

Exceptions will not necessarily result in denial of award, but will be considered in determining Contractor responsibility. For any exception noted above, indicate below to whom it applies, initiating agency, and dates of action.

Note: The above certifications are part of the BID. Signing this BID on the signature portion thereof shall also constitute signature of these Certifications.

Experience

BIDDER shall identify three (3) most recently completed projects similar to WORK described in these CONTRACT DOCUMENTS.

	1	2	3
Project Title			
Public Agency			
Address			
Telephone No.			
Engineer in Charge			
Project Value ($)			
Date Accepted			
Claims Filed?*			

* If yes, please explain below:

Bid Schedule
For
JO-LIN SEWER LIFT STATION REHABILITATION

BIDDER agrees to perform all the WORK described in the CONTRACT DOCUMENTS for the following unit and lump sum prices and understands that the quantity of WORK shown is approximate only. The schedule shall be completed by the BIDDER with the unit and lump sum prices entered in numerals. The extensions shall be made by the BIDDER. In case of discrepancy between the unit prices and the extension thereof, the unit price shall be considered as correct when evaluating BIDS.

ITEM NO.	ITEM	QUANTITY AND UNIT			UNIT PRICE		AMOUNT
1	Mobilization/Demobilization	1	LS	$		$	
2	Furnish & Install Sanitary Sewer Lift Station	1	LS	$		$	
3	Furnish & Install 6-Inch DIP Bends and Fittings	1	LS	$		$	
4	Furnish & Install 6-Inch DIP Valves	1	LS	$		$	
5	Furnish & Install 6-Inch DIP	45	LF	$		$	
6	Reconstruct Existing Lift Station Bottom	1	LS	$		$	
7	Furnish & Install Electrical (Controls, Wiring & Appurtenances)	1	LS	$		$	
8	Electrical Fees	1	LS	$		$	
9	Demolition (Removal: (E) Pumps, (E) Controls, and Piping)	1	LS	$		$	
10	Wet Well Coating	22	VF	$		$	
11	Bypass Pumping	1	LS	$		$	
12	Remove Concrete (Sidewalk & Driveway)	157	SF	$		$	
13	Remove Curb and Gutter	17	LF	$		$	
14	Remove Asphalt Pavement	344	SF	$		$	
15	Minor Concrete (Sidewalk)	157	SF	$		$	
16	Minor Concrete (Curb and Gutter)	17	LF	$		$	
17	Asphalt Replacement	344	SF	$		$	

TOTAL: $ ____________________

Note: The representations made herein are made under penalty of perjury. Any information contained in the BID which is proven false shall be considered nonresponsive and this BID shall be rejected.

Bid Bond

We, ____

as CONTRACTOR, and ____

as Surety, jointly and severally, bind ourselves, our heirs, representatives, successors and assigns, as set forth herein, to the **City of Los Banos** (herein called “OWNER”) for payment of the penal sum of ____

____Dollars ($______________),

lawful money of the United States. Contractor has submitted the accompanying Bid Proposal for the construction of: **JO-LIN SEWER LIFT STATION REHABILITATION**

If the CONTRACTOR is awarded the contract and enters into a written Agreement, in the form prescribed by the OWNER, at the price designated by BID Proposal, and files a PAYMENT BOND and PERFORMANCE BOND with the OWNER, or substitute security in lieu thereof, in the time and manner specified by the OWNER, and carries all insurance in type and amount which conforms to the General Provisions, Special Provisions, and Technical Specifications in these CONTRACT DOCUMENTS and furnishes required certificates and endorsements thereof, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

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

CONTRACTOR and Surety agree that if the OWNER is required to engage the services of an attorney in connection with the enforcement of this bond, each shall pay OWNER’S reasonable attorney's fees incurred with or without suit.

Executed on ______________________, 20____

____
Contractor

(Seal if Corporation)

By: ______________________________

Title ______________________________

[SIGNATURE SHEET CONTINUES ONTO NEXT PAGE]

Any claims under this bond may be addressed to:

______________________________ (name and address of Surety)

____

____

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

____

____

____

______________________________ (phone number of Surety's agent in California)

(Attach Acknowledgment)

____
Surety

By ______________________________
(Attorney-in-Fact)

Notice: No substitution or revision to this bond form will be accepted. Sureties must be authorized to do business in and have an agent for service of process in California.

All bond forms must be acknowledged before a Notary Public by both the Contractor and the Surety. Attorneys-in-fact who sign bond forms must file with each bond a certified and effective dated copy of their power of attorney.

Agreement

SAMPLE

Note: Particulars left blank in this sample will be filled with project specific information as outlined in these bid documents.

THIS AGREEMENT is dated as of the ________day of _______in the year 2016 by and between the **City of Los Banos, a California municipal corporation** ("OWNER") and [ENTER NAME AND TYPE OF ENTITY] ("CONTRACTOR").

OWNER and CONTRACTOR, in consideration of the mutual covenants hereinafter set forth, agree as follows:

1. WORK. CONTRACTOR shall complete the WORK indicated in OWNER's Contract Documents entitled "[ENTER PROJECT NAME]."

The WORK is generally described as follows:

- Construction of [ENTER DESCRIPTION OF WORK].
- CONTRACTOR shall furnish all of the material, supplies, tools, equipment, labor and other services necessary for the construction and completion of the WORK described herein.

2. CONTRACT TIME. The CONTRACTOR shall commence the WORK required by the CONTRACT DOCUMENTS within 10 calendar days after the date of the NOTICE TO PROCEED and will complete the same within the time period set forth in the BID, unless the period for completion is extended otherwise by the CONTRACT DOCUMENTS.

3. LIQUIDATED DAMAGES. OWNER and CONTRACTOR recognize that time is of the essence of this Agreement and that OWNER will suffer financial loss if the WORK is not completed within the time specified in Paragraph 3 herein, plus any extensions thereof allowed in accordance with Paragraph 21, Time for Completion and Liquidated Damages, of the General Provisions. The parties also recognize the delays, expense and difficulties involved in proving in a legal proceeding the actual loss suffered by OWNER if the WORK is not completed on time. Accordingly, instead of requiring any such proof, OWNER and CONTRACTOR agree that as liquidated damages for delay (but not as a penalty) CONTRACTOR shall pay OWNER Eight Hundred Dollars ($ 800.00) for each day that passes after the time specified in Paragraph 3 herein.

4. CONTRACT PRICE. OWNER shall pay CONTRACTOR for completion of the WORK in accordance with the Contract Documents in current funds the amount set forth in the Bid Schedule(s). The CONTRACTOR agrees to perform all of the WORK described in the CONTRACT DOCUMENTS for the unit and lump sum prices set forth in the Bid Schedule(s).

5. PAYMENT PROCEDURES. CONTRACTOR shall submit Applications for Payment in accordance with Paragraph 24, Progress Estimates, of the General Provisions. Applications for Payment will be processed by OWNER as provided in the General Provisions.

6. CONTRACT DOCUMENTS. The Contract Documents which comprise the entire agreement between OWNER and CONTRACTOR concerning the WORK consist of this Agreement and the following attachments to this Agreement:

(A) Advertisement for Bids
(B) Information for Bidders
(C) Bid
(D) Bid Bond
(E) Agreement
(F) Payment Bond
(G) Performance Bond
(H) Notice of Award
(I) Notice to Proceed
(J) Change Order
(K) General Provisions
(L) Special Provisions
(M) Technical Specifications prepared by Provost & Pritchard entitled "Jo-Lin Sewer Lift Station Rehabilitation", dated January 15, 2016.
(N) Drawings prepared by Provost & Pritchard numbered C-1 through C-11.
(O) Addenda

No. ______________, dated_________________________2016

No. ______________, dated_________________________2016

There are no Contract Documents other than those listed in this Paragraph 6. The Contract Documents may only be amended by Change Order as provided in Paragraph 19, Changes in the Work, of the General Provisions.

7. MISCELLANEOUS.

A. Terms used in this Agreement which are defined in Paragraph 1 of the General Provisions will have the meanings indicated in the General Provisions.

B. No assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and specifically but without limitation monies that may become due and monies that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

C. OWNER and CONTRACTOR each binds itself, its partners, successors, assigns and legal representatives to the other party hereto, its partners, successors, assigns and legal representatives in respect of all covenants, agreements and obligations contained in the Contract Documents.

D. The Laws of the State of California shall govern this Agreement. Venue is Merced County. The provisions of this paragraph shall survive expiration or other termination of this Agreement regardless of the cause of such termination.

E. All bids become property of the OWNER. All bids, including the accepted bid and any subsequent contract become public records per the requirements of the California Government Code, Sections 6250-6270, "California Public Records Act". Proprietary material must be clearly marked as such. Pricing and service elements of the successful bid are not consider proprietary information. The OWNER will treat all information submitted in a bid as available for public inspection once the OWNER has selected a contractor. If you believe that you have a legally justifiable basis under the California Public Records Act (Government Section 6250 et. seq.) for protecting the confidentiality of any information contained within your bid, you must identify any such information, together with the legal basis of your claim in your bid. In order for the OWNER to assess confidentiality of any such information on your behalf, you must request, execute and submit an OWNER-prepared written agreement to defend and indemnify the OWNER for any liability, costs, and expenses incurred in asserting such confidentiality as part of your bid. The final determination as to whether the OWNER will assert your claim of confidentiality on your behalf shall be sole discretion of the OWNER.

F. This Agreement shall not be interpreted in favor of any Party by virtue of said Party not having prepared this Agreement.

G. If any time period provided for in this Agreement ends on the day other than a Business Day, the time period shall be extended to the next Business Day.

IN WITNESS WHEREOF, OWNER and CONTRACTOR have caused this Agreement to be executed the day and year first above written.

____________________________ By: ______________________________________

Date Authorized Representative of OWNER

Title: ______________________________________

ATTEST:

____

Lucille L. Mallonee
City Clerk

APPROVED AS TO FORM:

____

William A. Vaughn
City Attorney

____________________________ By: ______________________________________

Date Authorized Representative of CONTRACTOR

Title: ______________________________________

(Seal if Corporation)

(Attach Acknowledgement for Authorized Representative of Contractor)

Certificate of Contractor

I, ____
(Name)

certify that I am a/the ____
(Title)

designate sole proprietor, partner in partnership, or corporate officer with Contractor License Number _______________ in the entity named as CONTRACTOR in the foregoing AGREEMENT. I hereby expressly certify that the name of the entity to which I am associated is

____
(Company Name)

that this entity is in good standing and has complied with all applicable laws and regulations, and that I have been expressly authorized by the proper parties in this entity to execute the Agreement on behalf of the above-named entity.

ATTEST:

Signature:____

This form must be acknowledged before a Notary Public. The acknowledgement must be attached.

Payment Bond

We, ____

as CONTRACTOR, and ____

as Surety, jointly and severally, bind ourselves, our heirs, representatives, successors and

assigns, as set forth herein, to the **City of Los Banos** (herein called "OWNER") for payment

of the penal sum of ____

____Dollars ($ ____________),

lawful money of the United States. OWNER has awarded the Contract and entered into an

Agreement with the CONTRACTOR for the construction of:

JO-LIN SEWER LIFT STATION REHABILITATION

If CONTRACTOR or any of his SUBCONTRACTORs fails to pay any of the persons named in Section 3181 of the California Civil Code, or amounts due under the Unemployment Insurance Code with respect to work or labor performed under the Contract or during the one-year guarantee period, or for any amounts required to be deducted, withheld, and paid over to the Franchise Tax Board from the wages of employees of the CONTRACTOR and his SUBCONTRACTORs pursuant to Section 13020 of the Unemployment Insurance Code, with respect to such work and labor, then Surety will pay the same in an amount not exceeding the sum specified above, and also will pay, in case suit is brought upon this bond, such reasonable attorney's fees as shall be fixed by the court.

This bond shall insure to the benefit of any of the persons named in Section 3181 of the California Civil Code, so as to give a right of action to them or their assigns in any suit brought upon this bond.

Surety agrees that no change, extension of time, alteration, or addition to the terms of the Contract, or the work to be performed, or the Provisions shall in any way affect its obligation on this bond, and it does hereby waive notice thereof.

CONTRACTOR and Surety agree that should Owner become a party to any action on this bond that each will also pay Owner's reasonable attorney's fees incurred therein in addition to the above sum.

[SIGNATURE SHEET BEGINS ON NEXT PAGE]

Executed in four original counterparts on: _____________________________, 20_____

____
Contractor

(Seal if Corporation) By: _____________________________________

Title: _____________________________________

(Attach Acknowledgment of Authorized Representative of Contractor)

Any claims under this bond may be addressed to:

_____________________________________ (name and address of Surety)

____

____

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

____

____

____

_____________________________________ (phone number of Surety's agent in California)

(Attach Acknowledgment)

____
Surety

By _____________________________________
(Attorney-in-Fact)

Notice: No substitution or revision to this bond form will be accepted. Sureties must be authorized to do business in and have an agent for service of process in California.

All bond forms must be acknowledged before a Notary Public by both the CONTRACTOR and the Surety. Attorneys-in-fact who sign bond forms must file with each bond a certified and effective dated copy of their power of attorney.

Performance Bond

We, ____

as CONTRACTOR, and ____

as Surety, jointly and severally, bind ourselves, our heirs, representatives, successors and

assigns, as set forth herein, to the **City of Los Banos** (herein called "OWNER") for payment

of the penal sum of ____

____Dollars ($ ______________),

lawful money of the United States. OWNER has awarded the Contract and entered into an

Agreement with the CONTRACTOR for the construction of:

JO-LIN SEWER LIFT STATION REHABILITATION

The condition of this obligation is such that if the CONTRACTOR shall in all things abide by and well and truly keep and perform the covenants, and agreements in the said CONTRACT Agreement, and any alteration thereof made as therein provided, on his part to be kept and performed at the time and in the manner therein specified, and shall faithfully fulfill the one-year guarantee of all materials and workmanship, and shall indemnify and save harmless the OWNER and the OWNER'S Representative, and their consultants, and each of their directors, officers, employees and agents, as therein stipulated, this obligation shall become null and void, otherwise, it shall be and remain in full force and effect.

The PERFORMANCE BOND shall remain in full effect during the one-year guaranty period following the completion of the WORK.

Surety agrees that no change, extension of time, alteration, or addition to the terms of the General Provisions, Special Provisions, and Technical Specifications in these CONTRACT DOCUMENTS shall in anyway affect its obligation in the bond, and it does hereby waive notice thereof.

CONTRACTOR and Surety agree that if the OWNER is required to engage the services of an attorney in connection with the enforcement of this bond, each shall pay OWNER'S reasonable attorney's fees incurred with or without suit, in addition to the above sum.

[SIGNATURE SHEET BEGINS ON NEXT PAGE]

Executed in four original counterparts on : ______________________________, 20_____

____
Contractor

(Seal if Corporation) By: ______________________________

Title: ______________________________

(Attach Acknowledgment of Authorized Representative of Contractor)

Any claims under this bond may be addressed to:

______________________________ (name and address of Surety)

____

____

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

____

____

____

______________________________ (phone number of Surety's agent in California)

(Attach Acknowledgment)

____
Surety

By ______________________________
(Attorney-in-Fact)

Notice: No substitution or revision to this bond form will be accepted. Sureties must be authorized to do business in and have an agent for service of process in California.

All bond forms must be acknowledged before a Notary Public by both the Contractor and the Surety. Attorneys-in-fact who sign bond forms must file with each bond a certified and effective dated copy of their power of attorney.

Notice of Award

To: ______________________________ Date: ______________________________

______________________________ Project: ______________________________

______________________________ ______________________________

The OWNER has considered the BID submitted by you for the above described WORK dated________________, 20______.

You are hereby notified that your BID has been accepted for the unit and lump sum prices set forth in the Bid Schedule totaling $____________________.

You are required by the Information for Bidders to execute the Agreement and furnish the required CONTRACTOR'S PERFORMANCE BOND and PAYMENT BOND within ten (10) calendar days for the date of this Notice to you.

Before the Notice to Proceed can be issued, all required Certificates of Insurance, as stated in Section 29 of the General Provisions, and a copy of your Los Banos Business License must be submitted.

If you fail to execute said Agreement and to furnish said BONDS within ten days from the date of this Notice, said OWNER will be entitled to consider all your rights arising out of the OWNER'S acceptance of your BID as abandoned and as a forfeiture of your BID BOND. The OWNER will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the OWNER.

____
OWNER

By ______________________________

Title ______________________________

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD
is hereby acknowledged by
(Name of Contractor)
____

this _______ day of _______________ ,20_____

By ______________________________

Title ______________________________

Notice to Proceed

To: ______________________________ Date: ______________________________
______________________________ Project: ______________________________
______________________________ ______________________________

You are hereby notified to commence WORK in accordance with the Agreement dated ______________, 20______, on or before __________________20______, and you are to complete the Work by __________________, 20______.

You are required to return an acknowledged copy of this NOTICE TO PROCEED to the OWNER.

____
OWNER

By ______________________________

Title ______________________________

ACCEPTANCE OF NOTICE
Receipt of the above NOTICE TO PROCEED
is hereby acknowledged by
(Name of Contractor)
____

this _______ day of _______________ ,20_____

By ______________________________

Title ______________________________

Change Order

Order No.______________________

Date: ______________________

Agreement Date:________________

PROJECT: ___________________________

OWNER: ___________________________

CONTRACTOR:___________________________

The following changes are hereby made to the CONTRACT DOCUMENTS:

Justification:

Change to CONTRACT PRICE:

Original CONTRACT PRICE:	$ ____________________
Current CONTRACT PRICE adjusted by previous CHANGE ORDER:	$ ____________________
The CONTRACT PRICE due to this CHANGE ORDER will be (increased) (decreased) by:	$ ____________________
The new CONTRACT PRICE including this CHANGE ORDER will be:	$ ____________________

Change to CONTRACT TIME:

The CONTRACT TIME will be (increased) (decreased) by calendar days.	______________________
The date for completion of all WORK will be:	______________________

The undersigned hereby agrees to the above-described amendment of the Contract.

____

CONTRACTOR

____

OWNER

This Change Order shall become a part of the Contract Documents only upon signature of both parties.

General Provisions

1. Terms and Definitions

Wherever used in the Contract Documents, the following terms shall have the meanings indicated, which shall be applicable to both the singular and plural thereof:

Addenda - Written or graphic instruments issued prior to the execution of the Agreement which modify or interpret the Contract Documents, Drawings and Specifications, by additions, deletions, clarifications or corrections.

ANSI – American National Standards Institute, current designation as of the Bid date unless otherwise indicated.

ASME – American Society of Mechanical Engineers, current designation as of the Bid date unless otherwise indicated.

ASTM – American Society for Testing Materials, current designation as of the Bid date unless otherwise indicated.

AWWA – American Water Works Association, current designation as of the Bid date unless otherwise indicated.

Bid - The offer or proposal of the Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

Bidder - Any person, firm or corporation submitting a Bid for the Work.

Bonds - Bid, Performance and Payment Bonds and other instruments of security, furnished by the Contractor and his surety in accordance with the Contract Documents.

Change Order - A written order to the Contractor authorizing an addition, deletion or revision in the Work within the general scope of the Contract Documents, or authorizing an adjustment in the Contract Price or Contract Time.

Completion - That date as certified by the Engineer when the construction of the Project or a specified part thereof is sufficiently completed, in accordance with the Contract Documents, so that the Project or specified part can be utilized for the purposes for which it is intended.

Contract Documents - The **Contract**, including Advertisement for Bids, Information for Bidders, Bid, including Bid Representations and Certifications, Bid Bond, **Agreement**, Payment Bond, Performance Bond, Notice Of Award, Notice To Proceed, Change Order, General Conditions, Special Conditions, Specifications, Drawings, and Addenda.

Contract Price – The total monies payable to the Contractor under the terms and conditions of the Contract Documents.

Contract Time – The number of calendar days stated in the Contract Documents for the completion of the Work.

Contractor – The person, firm or corporation with whom the Owner has executed the Agreement.

Drawings – The part of the Contract Documents which shows the characteristics and scope of the Work to be performed and which have been prepared or approved by the Engineer.

Engineer – City Engineer of the City of Los Banos, acting either directly or through properly authorized agents, such agents, acting within the scope of the particular duties entrusted to them.

Field Order – A written order effecting a change in the Work not involving an adjustment in the Contract Price or an extension of the Contract Time, issued by the Engineer to the Contractor during construction.

IEEE – Institute of Electrical and Electronics Engineers, current designation as of the Bid date unless otherwise indicated.

NEMA – National Electrical Manufacturers Association, current designation as of the Bid date unless otherwise indicated.

Notice of Award – The written notice of the acceptance of the Bid from the Owner to the successful Bidder.

Notice to Proceed – Written communication issued by the Owner to the Contractor authorizing him to proceed with the Work and establishing the date of commencement of the Work.

Owner – City of Los Banos.

Production Data – All illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate a material, product or system for some portion of the Work.

Project – The undertaking to be performed as provided in the Contract Documents.

REA – Rural Electrification Association, current designation as of the Bid date unless otherwise indicated.

Samples – Physical examples which illustrate materials, equipment or workmanship, and establish standards by which the Work will be judged.

Shop Drawings – All drawings, diagrams, schedules and other data which are specifically prepared for the Work by the Contractor, a SUBCONTRACTOR, manufacturer, supplier or distributor, to illustrate some portion of the Work.

Specifications – A part of the Contract Documents consisting of written descriptions of a technical nature of materials, equipment, construction systems, standards and workmanship.

Standards - City of Los Banos Standard Specifications, The Standard Specifications of the Department of Transportation of the State of California (Caltrans) dated 2010 and subsequent updates to that 2010 edition, and The Standard Plans of the Department of Transportation of the State of California (Caltrans) dated 2010 and subsequent updates to this 2010 edition.

Subcontractor – An individual, firm or corporation having a direct contract with the Contractor or with any other Subcontractor for the performance of a part of the WORK at the site.

Supplier – Any person or organization who supplies materials or equipment for the Work, including that fabricated to a special design, but who does not perform labor at the site.

Work – All labor necessary to produce the construction required by the Contract Documents, and all materials and equipment incorporated or to be incorporated in the Project.

Written Notice – Any notice to any party of the Agreement relative to any part of this Agreement in writing and considered delivered and the service thereof completed, when posted by certified or registered mail to the said party at his last given address, or delivered in person to said party or his authorized representative on the WORK.

2. Order of Precedence of Contract Documents

In resolving conflicts resulting from errors or discrepancies in any of the CONTRACT DOCUMENTS, the order of precedence shall be as follows:

1. Permits from other agencies as may be required by law
2. Change orders
3. Agreement
4. Addenda
5. Contractor’s Bid (Bid Form)
6. Notice Inviting Bids
7. Instructions to Bidders

8. Supplementary General Conditions
9. General Conditions
10. Special Provisions
11. Drawings
12. Referenced Standard Specifications

If the conflicts cannot be resolved by the precedence prescribed above, the most stringent requirements shall prevail.

3. Venue

CONTRACTOR, and any Subcontractor, Supplier and any other person or organization performing any part of WORK, agree that each of them will waive jurisdiction and venue and shall submit to the jurisdiction of the courts of the State of California in the County of Merced, regardless of residence or domicile, with respect to any actions or suits at law or in equity arising under or related to the bidding, award or performance of the WORK or with regard to any matter whatsoever arising out of or relating to the validity, construction, interpretation or reinforcement of the AGREEMENT as against OWNER or any of their consultants, and/or any of their respective directors, officers, employees, representatives or agents.

4. Giving Notice

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

5. Cumulative Remedies

The duties and obligations imposed by these General Provisions and the rights and remedies available hereunder to the parties hereto, and, in particular but without limitation, the warranties, guarantees and obligations imposed upon CONTRACTOR by the General Provisions and all of the rights and remedies available to OWNER thereunder are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by laws or regulations, by special warranty or guarantee or by other provisions of the CONTRACT DOCUMENTS, and the provisions of this paragraph will be as effective as if repeated specifically in the CONTRACT DOCUMENTS in connection with each particular duty, obligation, right and remedy to which they apply.

6. Non-discrimination

During the performance of the PROJECT, CONTRACTOR and SUBCONTRACTORs shall not unlawfully discriminate against any employee or applicant for employment because of race, color, ancestry, religion, sex, national origin, marital status, age, medical condition (cancer related), physical handicap (including AIDS), or sexual orientation. Equal employment extends, but is not limited to recruitment, compensation, benefits, layoff, termination, and all other conditions of employment. CONTRACTOR and SUBCONTRACTORs shall ensure that the evaluation/treatment of their employees and applicants for employment are free of such discrimination. CONTRACTOR and Sub-contractors shall comply with the provisions of the Fair Employment and Housing Act (Government Code, Section 12900 et seq.) and the applicable regulations promulgated there under (California Administrative Code, Title 2, Section 7285.0 et seq.). The applicable regulations of the Fair Employment and Housing Commission implementing Government Code, Section 12900, set forth in Chapter 5 of Division 4 of Title 2 of the California Administrative Code and incorporated into this Contract Agreement by reference and made a part hereof as if set forth in full.

CONTRACTOR and any SUBCONTRACTORs shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement.

CONTRACTOR shall include the nondiscrimination and compliance provisions of the clause in all subcontracts to perform WORK under the Contract.

CONTRACTOR shall grant access by representative of the Department of Fair Employment and Housing and the OWNER upon reasonable notice at any time during normal business hours, but in no case less than twenty-four (24) hours notice, to such of its books, records, accounts, other sources of information and its facilities as said Owner shall require to ascertain compliance with this clause.

7. Non-discrimination of the Disabled

The OWNER will not aid or perpetuate discrimination against a qualified disabled individual by funding as an agency, organization, or person that discriminates on the basis of handicap in providing aid, benefit, or service to beneficiaries of the program or activity. The OWNER is committed to provide access to all OWNER services, programs, and meetings open to the public for people with disabilities. In this regard the OWNER and all of its vendors and CONTRACTOR will take all reasonable steps to ensure that disabled individuals have the maximum opportunity for the same level of aid, benefit, or service as any other individual.

8. Additional Instructions and Detail Drawings

The CONTRACTOR may be furnished additional instructions and detail drawings by the Engineer, as necessary to carry out the WORK required by the CONTRACT DOCUMENTS. The additional drawings and instructions thus supplied will become a part of the CONTRACT DOCUMENTS. The CONTRACTOR shall carry out the WORK in accordance with the additional detail drawings and instructions.

9. Schedules, Reports and Records

The CONTRACTOR shall submit to the OWNER such schedules, reports, records and other data as the OWNER may request concerning WORK performed or to be performed.

Prior to the first partial payment estimate, the CONTRACTOR shall submit schedules showing the order in which he proposed to carry on the WORK, including dates at which he will start the various parts of the WORK, estimated date of completion of each part and, as applicable:

A. A detailed cost breakdown of the WORK under each bid item awarded. The breakdown, after receiving favorable review by the ENGINEER, will become the basis for partial payment determination. Elements of WORK shall be grouped by building, structure, pipeline, system, etc. Within each grouping, work shall be itemized by readily measurable quantities of work completed in place. For example, concrete should be in units of cubic yard including form work and reinforcing steel. Mobilization costs, bond and insurance costs, and overhead costs shall not be prorated over items of WORK. In the event the cost breakdown is not favorably reviewed by the ENGINEER, another cost breakdown shall be submitted that is mutually acceptable to the CONTRACTOR and the ENGINEER.

B. The dates at which special detail drawings will be required; and respective dates for submission of SHOP DRAWINGS, the beginning of manufacture, the testing and the installation of materials, supplies and equipment. The CONTRACTOR shall also submit a schedule of payments that he anticipates he will earn during the course of the WORK.

10. Drawings and Specifications

The intent of the DRAWINGS and SPECIFICATIONS is that the CONTRACTOR shall furnish all labor, materials, tools, equipment, and transportation necessary to complete the PROJECT in an acceptable manner, ready for use, occupancy or operation by the OWNER.

In case of conflict between the DRAWINGS and SPECIFICATIONS, the SPECIFICATIONS shall govern. Figure dimensions on DRAWINGS shall govern over scale dimensions and detailed DRAWINGS shall govern over general DRAWINGS.

Any discrepancies found between the DRAWINGS and SPECIFICATIONS and site condition or any inconsistencies or ambiguities in the DRAWINGS or SPECIFICATIONS shall be immediately reported to the ENGINEER, in writing, who shall promptly correct such inconsistencies or ambiguities in writing. Work done by the CONTRACTOR after his discovery of such discrepancies, inconsistencies or ambiguities shall be done at the CONTRACTOR's risk.

The OWNER will furnish to the CONTRACTOR, free of charge, six copies of DRAWINGS and SPECIFICATIONS for the WORK. The CONTRACTOR shall keep one copy of all current DRAWINGS and SPECIFICATIONS on the job site, in good order, available to the ENGINEER and his representatives.

All DRAWINGS, SPECIFICATIONS, and copies thereof furnished by the OWNER are the property of the OWNER. They are not to be used on other work, and, with the exception of the signed Contract set, are to be returned to the OWNER on request, at the completion of the WORK.

11. Shop Drawings, Production Data and Samples

The CONTRACTOR shall review, approve and submit to the ENGINEER all SHOP DRAWINGS, PRODUCTION DATA and SAMPLES as may be necessary for prosecution of the WORK and as required by the CONTRACT DOCUMENTS. The CONTRACTOR shall review and approve all SHOP DRAWINGS, PRODUCTION DATA and SAMPLES prior to submitting them to the ENGINEER. By approving and submitting SHOP DRAWINGS, PRODUCTION DATA and SAMPLES, the CONTRACTOR represents that he has determined and verified all materials, measurements and criteria related thereto, and that he has checked and coordinated the information contained within such submittals with the requirements of the CONTRACT DOCUMENTS. Any SHOP DRAWING, PRODUCTION DATA or SAMPLE submitted to the ENGINEER without having been approved by the CONTRACTOR will be returned unreviewed to the CONTRACTOR.

For each item where SHOP DRAWINGS, PRODUCTION DATA or SAMPLES are required, the CONTRACTOR shall submit a minimum of six approved sets. The ENGINEER shall review all SHOP DRAWINGS, PRODUCTION DATA and SAMPLES and retain three sets after his review. The remaining sets shall be returned to the CONTRACTOR with actions defined as follows:

A. NO EXCEPTIONS TAKEN – Accepted subject to its compatibility with future submissions and additional partial submissions for portions of the WORK not covered in this submission.

B. MAKE CORRECTIONS NOTED – Same as NO EXCEPTIONS TAKEN except that minor corrections as noted shall be made by the CONTRACTOR.

C. REVISE AND RESUBMIT – Rejected because of major inconsistencies or errors which shall be resolved by the CONTRACTOR prior to subsequent review by the Engineer.

D. REJECTED – Submitted material does not conform to CONTRACT DOCUMENTS in major respect.

The ENGINEER'S review is only for general conformance with the design concept of the project and general compliance with the information given in the CONTRACT DOCUMENTS. It shall not include review of quantities, dimensions, weights or gauges, fabrications processes, construction methods, coordination with other trades, or construction safety precautions, all of which are the responsibility of the CONTRACTOR.

The ENGINEER shall not be responsible for any deviations from the CONTRACT DOCUMENTS not brought to the attention of the ENGINEER in writing by the CONTRACTOR and acknowledged in writing by the ENGINEER.

Portions of the WORK requiring SHOP DRAWINGS, PRODUCTION DATA and SAMPLES shall not begin until the submission has been favorably reviewed by the ENGINEER. A copy of each favorably reviewed SHOP DRAWING, PRODUCT DATA and SAMPLE shall be kept in good order by the

CONTRACTOR at the site and shall be available to the ENGINEER.

12. Materials, Services and Facilities

It is understood that, except as otherwise specifically stated in the CONTRACT DOCUMENTS, the CONTRACTOR shall provide and pay for all materials, labor, tools, equipment, water, light, power, transportation, supervision, and all other services and facilities of any nature whatsoever necessary to execute, complete, and deliver the WORK within the specified time.

Materials and equipment shall be so stored as to insure the preservation of their quality and fitness for the WORK. Stored materials and equipment to be incorporated in the WORK shall be located so as to facilitate prompt inspection.

Manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer.

Materials, supplies and equipment shall be in accordance with samples submitted by the CONTRACTOR and reviewed by the ENGINEER.

Materials, supplies or equipment to be incorporated into the WORK shall not be purchased by the CONTRACTOR or any SUBCONTRACTOR subject to a chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller.

13. Inspection and Testing

All materials and equipment used in the construction of the PROJECT shall be subject to adequate inspection and testing in accordance with generally accepted standards, as required and defined in the CONTRACT DOCUMENTS.

The CONTRACTOR shall provide, at his expense, the necessary testing and inspection services required by the CONTRACT DOCUMENTS, unless otherwise provided. (See Section 6 of the Special Provisions)

The OWNER shall provide all other inspections and testing services not required by the CONTRACT DOCUMENTS. If the CONTRACT DOCUMENTS, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction specifically require any WORK to be inspected, tested, approved by someone other than the CONTRACTOR, the CONTRACTOR will give the ENGINEER timely notice of readiness. The CONTRACTOR will then furnish the ENGINEER the required certificates of inspection, testing or approval.

Neither observations by the ENGINEER nor inspections, tests or approvals by persons other than the CONTRACTOR shall relieve the CONTRACTOR from his obligations to perform the WORK in accordance with the requirements of the CONTRACT DOCUMENTS.

The ENGINEER and his representatives will at all times have access to the WORK. In addition, authorized representatives and agents of the OWNER and appropriate Federal or State agencies shall be permitted to inspect all work, material, payrolls, records of personnel, invoices of materials, and other relevant data and records. The CONTRACTOR will provide proper facilities for such access and observation of the WORK and also for any inspection or testing thereof.

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

If any WORK has been covered which the ENGINEER has not specifically requested to observe prior to it being covered, or if the ENGINEER considers it necessary or advisable that covered WORK be inspected or tested by others, the CONTRACTOR, at the ENGINEER'S request, will uncover expose or otherwise make available for observation, inspection or testing as the ENGINEER may require, that portion of the WORK in question, furnishing all necessary labor, materials, tools, and equipment. If it is found that such WORK is not found to be defective, the CONTRACTOR will be allowed an increase in the CONTRACT PRICE of an extension of the CONTRACT TIME, or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction and an appropriate Change Order shall be issued.

14. Substitutions

Whenever a material, article or piece of equipment is identified on the DRAWINGS or SPECIFICATIONS by reference to brand name or catalogue number, it shall be understood that this is referenced for the purpose of defining the performance of other salient requirements and that other products of equal capacities, quality and function shall be considered. The CONTRACTOR may recommend the substitution of a material, article or piece of equipment of equal substance and function for those referred to in the CONTRACT DOCUMENTS by reference to brand name or catalogue number, and if, in the opinion of the ENGINEER, such material, article, or piece of equipment is of equal substance and function to that specified, the ENGINEER may approve its substitution and use by the CONTRACTOR. The CONTRACTOR warrants that if substitutes are approved, no major changes in the function or general design of the PROJECT will result. Incidental changes or extra component parts required to accommodate the substitute will be made by the CONTRACTOR without a change in the CONTRACT PRICE or CONTRACT TIME.

15. Patents

The CONTRACTOR shall pay all applicable royalties and license fees. He shall defend all suits or claims for infringement of any patent rights and save the OWNER harmless from loss on account thereof, except that the OWNER shall be responsible for any such loss when a particular process, design, or the product of a particular manufacturer or manufacturers is specified, but if the CONTRACTOR has reason to believe that the design, process or product specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the ENGINEER.

16. Surveys, Permits and Regulations

The ENGINEER will furnish lines and grades as required for the construction of the WORK. The CONTRACTOR shall make a general check of all lines, dimensions and elevations and shall make all necessary rechecks during the progress of the WORK to avoid errors in construction. The CONTRACTOR shall be responsible for proper dimensions and fittings of all items of WORK being performed by him. Should any discrepancy be found in lines, dimensions or elevations, they shall be reported to the ENGINEER immediately.

The CONTRACTOR shall protect all existing property and survey monuments, including survey control monuments for this WORK. The CONTRACTOR is responsible for protecting and preserving survey monuments and other survey markers. Any survey monuments damaged as a direct or indirect result of construction activities shall be re-established by a duly licensed land surveyor at the CONTRACTOR's sole expense. A corner record shall be filed in accordance with State law for any reset monuments at the CONTRACTOR's sole expense.

The CONTRACTOR shall carefully preserve benchmarks, reference points and stakes and, in case of willful or careless destruction, he shall be charged with the resulting expense and shall be responsible for any mistakes that may be caused by their unnecessary loss or disturbance.

Permits and licenses of a temporary nature necessary for the prosecution of the WORK shall be secured and paid for by the CONTRACTOR. Permits, licenses and easements for permanent structures or permanent changes in existing facilities shall be secured and paid for by the OWNER, unless otherwise specified. The CONTRACTOR shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the WORK as drawn and specified. If the CONTRACTOR observes that the CONTRACT DOCUMENTS are at variance therewith, he shall promptly notify the ENGINEER in writing, and any necessary changes shall be adjusted as provided in Paragraph 19 of these General Provisions, Changes in the Work.

17. Protection of Work, Property and Persons

The CONTRACTOR shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the WORK. He will take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to all employees on the WORK and other persons who may be affected thereby, all the WORK and all materials or equipment to be incorporated therein, whether in storage on or off the site, and other property at the site or adjacent thereto, including trees, shrubs, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

The CONTRACTOR shall comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction. He shall erect and maintain, as required by the conditions and progress of the WORK, all necessary safeguards for safety and protection. He shall notify owners of adjacent utilities when prosecution of the WORK may affect them. The CONTRACTOR shall remedy all damages, injury or loss to any property caused, directly or indirectly, in whole or in part, by the CONTRACTOR, any SUBCONTRACTOR or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, except damage or loss attributable to the fault of the CONTRACT DOCUMENTS or to the acts or omissions of the OWNER or the ENGINEER or anyone employed by either of them or anyone for whose acts either of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of the CONTRACTOR.

In emergencies affecting the safety of persons or the WORK or property at the site or adjacent thereto, the CONTRACTOR, without special instruction or authorization from the ENGINEER or OWNER, shall act to prevent threatened damage, injury or loss. He will give the ENGINEER prompt WRITTEN NOTICE of any significant changes in the WORK or deviations from the CONTRACT DOCUMENTS caused thereby, and a CHANGE ORDER shall thereupon be issued covering the changes and deviations involved.

18. Supervision by Contractor

The CONTRACTOR shall supervise and direct the WORK. He shall be solely responsible for the means, methods, techniques, sequences and procedures of construction. The CONTRACTOR shall employ and maintain on the WORK, a qualified supervisor or superintendent who shall have been designated in writing by the CONTRACTOR as the CONTRACTOR'S representative at the site. The supervisor shall be present on the site at all times as required to perform adequate supervision and coordination of the WORK.

19. Changes in the Work

The OWNER may at any time, as the need arises, order changes within the scope of the WORK without invalidating the AGREEMENT. If such changes increase or decrease the amount due under the CONTRACT DOCUMENTS, or in the time required for performance of the WORK, an equitable adjustment shall be authorized by written CHANGE ORDER.

The ENGINEER may also, at any time, by issuing a FIELD ORDER, make changes in the details of the WORK. The CONTRACTOR shall proceed with the performance of any changes in the WORK so ordered by the ENGINEER unless the CONTRACTOR believes that such FIELD ORDER entitles him to a change in CONTRACT PRICE or CONTRACT TIME, or both, in which event he shall give the ENGINEER WRITTEN NOTICE thereof within seven (7) days after the receipt of the ordered change, and the CONTRACTOR shall not execute such changes pending the receipt of an executed CHANGE ORDER or further instruction from the OWNER.

20. Changes in Contract Price

The CONTRACT PRICE may be changed only by a written CHANGE ORDER. The value of any WORK covered by a CHANGE ORDER or of any claim for increase or decrease in the CONTRACT PRICE shall be determined by one or more of the following methods in the order of precedence listed below:

A. Unit prices previously approved.

B. An agreed lump sum.

C. If a lump sum or unit price cannot be mutually agreed upon, the CONTRACTOR shall be entitled to the sum of the following costs of doing the extra work:

   1. <u>Direct Labor Costs</u>. Charges for cost of all the labor furnished and used by the

CONTRACTOR shall be made for manual classifications up to and including general foreman. It will not include charges for Assistant Superintendents, Superintendents, Office Personnel, Timekeepers, and Maintenance and Mechanics. The time charged to extra work shall be subject to the daily approval of the ENGINEER and evidence of such daily approval shall be submitted with the billing. Labor rates used to calculate the costs shall be those so designated in the Advertisement for Bids. No time or charges will be allowed, except when the men 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 by the ENGINEER.

2. Equipment Costs. Charges for the rental and operation of the equipment furnished and used by the CONTRACTOR shall be made for all prime construction and automotive equipment. It will not include charges for equipment or tools with a new cost of $1,000.00 or less. Equipment time charges must be subject to the daily approval submitted with the billing. The equipment rental and operation rates used shall be those agreed upon by the ENGINEER and the CONTRACTOR prior to commencement of the extra work. No time or charges will be allowed except when equipment is actually being used for the proper and efficient performance or completion of the extra work as authorized.

3. Material Costs. Charges for the cost of materials furnished by the CONTRACTOR shall be made providing such furnishing was specifically authorized in the extra work order and the actual use verified by the ENGINEER. Charges must be net cost to the CONTRACTOR delivered at the job, and vendor’s invoice must accompany the billing along with verification of use of such materials by the ENGINEER.

4. Tools, Supplies, Overhead, Supervision and Profit. A charge for tools, supplies, overhead, supervision and profit will be allowed in the amount of 15% of the total Direct labor Costs, and Material Costs, as defined above.

Any extra work performed hereunder shall be subject to all of the provisions of the Contract and the CONTRACTOR’S sureties shall be bound with reference thereto as under the Contract.

21. Time for Completion and Liquidated Damages

The date of beginning and the time for completion of the WORK are essential conditions of the CONTRACT DOCUMENTS and the WORK embraced shall be commenced on a date specified in the NOTICE TO PROCEED.

Time is of the essence in this agreement. The CONTRACTOR shall proceed with the WORK at such a rate of progress to ensure full completion within the CONTRACT TIME. It is expressly understood and agreed, by and between the CONTRACTOR and the OWNER, that the CONTRACT TIME for the completion of the WORK described herein is a reasonable time.

The parties hereto agree that it is extremely difficult and impractical in this case to determine the actual damages the OWNER will suffer if the CONTRACTOR fails to complete the WORK within the CONTRACT TIME and for said reason, if the CONTRACTOR shall fail to complete the WORK within the CONTRACT TIME, or extension of time granted by the OWNER, then the CONTRACTOR will pay to the OWNER the amount for liquidated damages as specified in the AGREEMENT for each calendar day that the CONTRACTOR shall be in default after the time stipulated in the CONTRACT DOCUMENTS. The time for completion of the WORK shall be extended, and the CONTRACTOR shall not be charged with liquidated damages or any excess cost when the delay in completion of the WORK is due to the following, and the CONTRACTOR has promptly given WRITTEN NOTICE of such delay to the ENGINEER:

A. To any preference, priority or allocation order duly issued by the OWNER.

B. To unforeseeable caused beyond the control and without the fault or negligence of the CONTRACTOR, including but not restricted to, acts of God or of the public enemy, acts of the OWNER, acts of another CONTRACTOR in the performance of a contract with the OWNER, fires, floods, epidemics quarantine restrictions, strikes, freight embargoes, and climatic conditions which, in the opinion of the ENGINEER, make prosecution of the WORK unreasonably difficult.

C. To any delays of SUBCONTACTORS occasioned by any of the causes specified in the above paragraphs.

22. Correction of Work

The CONTRACTOR shall promptly remove from the premises all WORK rejected by the ENGINEER for failure to comply with the CONTRACT DOCUMENTS, whether incorporated in the construction or not, and the CONTRACTOR shall promptly replace and re-execute the WORK in accordance with the CONTRACT DOCUMENTS and without expense to the OWNER and shall bear the expense of making good all WORK of other contractors destroyed or damaged by such removal or replacement.

23. Suspension of Work, Termination and Delay

The OWNER may, at any time and without cause, suspend the WORK or any portion thereof for a period of not more than ninety days, or such further time as agreed upon by the CONTRACTOR, by WRITTEN NOTICE to the CONTRACTOR and the ENGINEER, which notice shall fix the date on which WORK shall be resumed. The CONTRACTOR will resume that WORK on the date so fixed. The CONTRACTOR will be allowed an increase in the CONTRACT PRICE or an extension of the CONTRACT TIME, or both, directly attributable to any such suspension.

If the CONTRACTOR is adjudged as bankrupt or insolvent, or if he makes a general assignment for the benefit of his creditors, or if a trustee or receiver if appointed for the CONTRACTOR or for any of his property, or if he files a petition to take advantage of any debtor’s act or to reorganize under the bankruptcy or applicable laws, or if he repeatedly fails to supply sufficient skilled workmen or suitable materials or equipment, or if he fails to make prompt payments to SUBCONTRACTORS or for labor, materials or equipment or if he disregards laws, ordinances, rules, regulations or orders of any public body having jurisdiction over the WORK or if he disregards the authority of the ENGINEER, or if he otherwise violates any provision of the CONTRACT DOCUMENTS, then the OWNER may, without prejudice to any other right or remedy and after giving the CONTRACTOR and his surety a minimum of ten (10) days from delivery of a WRITTEN NOTICE, terminate the services of the CONTRACTOR, and finish the WORK by whatever method he may deem expedient. In such case the CONTRACTOR shall not be entitled to receive any further payment until the WORK is finished. If the unpaid balance, the CONTRACTOR shall pay the difference to the OWNER. Such costs incurred by the OWNER will be determined by the ENGINEER and incorporated in a CHANGE ORDER.

Where the CONTRACTOR’S services have been so terminated by the OWNER, said termination shall not affect any right of the OWNER against the CONTRACTORS then existing or which may thereafter accrue. Any retention or payment of monies by the OWNER due the CONTRACTOR will not release the CONTRACTOR from compliance with the CONTRACT DOCUMENTS.

After ten (10) days from delivery of a WRITTEN NOTICE to the CONTRACTOR and the ENGINEER, the OWNER may without cause and without prejudice to any other right or remedy, elect to abandon the PROJECT and terminate the CONTRACT. In such case, the CONTRACTOR shall be paid for all WORK executed and any expense sustained plus reasonable profit.

If, through on act or fault of the CONTRACTOR, the WORK is suspended for a period of more than ninety (90) days by the OWNER or under an order of court or other public authority, or the ENGINEER fails to act on any request for payment within thirty (30) days after it is submitted, or the OWNER fails to pay the CONTRACTOR substantially the sum approved by the ENGINEER or awarded by arbitrators within thirty (30) days of its approval and presentation, then the CONTRACTOR may, after the (10) days from delivery of a WRITTEN NOTICE to the OWNER and the ENGINEER stop the WORK until he has been paid all amounts then due, in which event and upon resumption of the WORK, CHANGE ORDERS shall be issued for adjusting the CONTRACT PRICE or extending the CONTRACT TIME or both to compensate for the costs and delays attributable to the stoppage of the WORK.

24. Progress Estimates

On or about the last day of the calendar month, the CONTRACTOR will, except as hereinafter provided, make in writing and certify to the Owner an estimate which, in his opinion, is just and fair of the amount and value of the work completed by the CONTRACTOR up to that time in the performance of the Contract. In case of work for which unit prices are named in the Contract, the estimate shall be computed on the basis of said unit prices. In the case of work for which a lump sum is named in the Contract, the ENGINEER may use a breakdown of the lump sum price submitted by the CONTRACTOR, provided that such breakdown is submitted within 15 calendar days after the execution of the Agreement in a form acceptable to the ENGINEER. No payment will be made to the CONTRACTOR until such schedule has been submitted to and reviewed by the Engineer. To the figure thus arrived at shall be added any amounts due the CONTRACTOR for extra work and the amount of any approved claims for extra costs to the date of the Progress Estimate the retained percentage hereinafter provided for shall be deducted from the total thus computed; and from the remainder, there shall be further deducted any amounts due the OWNER from the CONTRACTOR for supplies or materials furnished or services rendered and any other amounts that may be due the OWNER under the terms of the Contract. In preparing estimates for partial payment, consideration shall be given to delivery on the site of pipe, and fittings which will become a part of the finished construction work and for which payment in full has been made by the CONTRACTOR, but no consideration will be given to preparatory work done or other materials on hand. From the balance thus determined shall be deducted the amount of all previous payments and the remainder shall constitute the partial estimate for that month. Such partial estimates shall not be required to be made by strict measurement, but may be made by measurement or by estimation or partly by one method and partly by the other and it shall be sufficient if they are approximate only. Partial estimates may be withheld or reduced if, in the opinion of the ENGINEER, the CONTRACTOR is not diligently and efficiently endeavoring to comply with the intent of the Contract.

25. Progress Payments

The OWNER will make payments on account of the Contract as follows: Not later than the 30th day of the month following the month in which the Contract is awarded, and the 30th day of each calendar month thereafter, the OWNER will pay to the CONTRACTOR 95% of the amount earned by the CONTRACTOR during the preceding month at the rate of prices set forth in the Contract, based on the estimate of the ENGINEER.

The retention will be held by the OWNER until 35 days following filing of the Notice of Completion.

26. Prompt Payment

The CONTRACTOR shall promptly pay all SUBCONTRACTORs and suppliers within ten (10) days of receipt of any progress payment, final payment or retention paid by the OWNER to the CONTRACTOR. CONTRACTOR shall advise all SUBCONTRACTORS and suppliers that all second-tier SUBCONTRACTORs and suppliers must be paid within then (10) days of their receipt of payment from the CONTRACTOR.

27. Acceptance and Final Payment

Upon receipt of WRITTEN NOTICE from the CONTRACTOR that the WORK is ready for final inspection and acceptance, the ENGINEER will promptly make such inspection, and when he finds the WORK acceptable under the Contract, and the Contract fully performed, he will promptly issue a final certificate, over his own signature, stating that the WORK required by this Contract has been completed. The OWNER then shall issue a formal Notice of Completion, and the entire balance found to be due shall be paid to the CONTRACTOR by the OWNER 35 days from the date of recording by the OWNER of the Notice of Completion of all WORK covered by this Contract.

Before issuance of the Notice of Completion, the CONTRACTOR shall submit evidence satisfactory to the OWNER that all payrolls, material bills, and other indebtedness connected with the WORK have been paid, or if not paid, then the CONTRACTOR shall submit evidence of the status of any unpaid indebtedness.

The making and acceptance of the final payment shall constitute a waiver of all claims by the OWNER except the following:

A. those arising from unsettled liens;

B. those arising from faulty work appearing within 12 months after the date of filing of the Notice of Completion;

C. those arising from failure to meet the requirements of the CONTRACT DOCUMENTS or the SPECIFICATIONS; or,

D. those arising from manufacturers' guarantees.

The acceptance by CONTRACTOR of the final payment referred to in this paragraph 27 herein, shall be a release of OWNER from all claims of liability to CONTRACTOR for anything done or furnished for, or relating to, the WORK or for any act or neglect of OWNER or of any person relating to or affecting the WORK, except demands against OWNER for the remainder, if any, of the amounts kept or retained under the provisions of Paragraph 25, Progress Payments, herein; and excepting pending, unresolved claims.

28. Quantities and Unit Prices

The quantities noted in the schedule are approximation for comparing BIDS, and no claim shall be made against the OWNER for excess or deficiency therein. Payment at the unit prices set forth in the schedule will constitute payment in full for the completed WORK and will include materials, supplies, labor, tools, machinery, and all other expenditures incident to satisfactory compliance with the Contract, unless otherwise specifically provided.

The quantities of WORK performed will be computed for payment by the ENGINEER on the basis of measurements taken by the ENGINEER, and these measurements shall be final and binding.

29. Insurance

The CONTRACTOR shall not commence Work under this Contract Agreement until he has obtained all the insurance required under this section and such insurance has been approved by the Owner, nor shall the CONTRACTOR allow any SUBCONTRACTOR to commence Work on his subcontract until the insurance required of the SUBCONTRACTOR has been so obtained and approved. All insurance required under this section shall be maintained at the expense of the CONTRACTOR continuously during the life of the Contract up to the date of acceptance of the Work by the Owner.

Commercial General Liability and Automobile Liability Insurance – The CONTRACTOR shall provide and maintain the following commercial general liability and automobile liability insurance:

A. Coverage – Coverage for commercial general liability and automobile liability insurance shall be at least as broad as the following:

    1. Insurance Services Office Commercial General Liability coverage (Occurrence Form CG 0001)

    2. Insurance Service Office Form Number CA 0001 (ed. 1/87) covering Automobile Liability, Code 1 (any auto)

B. Limits – The CONTRACTOR shall maintain limits no less than the following:

    1. General Liability – Two million dollars ($2,000,000) per occurrence for bodily injury, personal injury and property damage. If Commercial General Liability Insurance or other form with a general aggregate limit is used, either the general aggregate limit shall apply separately to the project/location (with the ISO CG 2501 or insurer's equivalent endorsement provided to the Owner) or the general aggregate limit shall be twice the required occurrence limit.

2. Automobile Liability – One million dollars ($1,000,000) per accident for bodily injury and property damage combine single limit.

C. Required provisions – The general liability and automobile liability policies are to contain, to be endorsed to contain the following provisions:

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

2. For any claims related to this Work, the CONTRACTOR's insurance shall be the primary insurance as respects the Owner and its directors, officers, employees, agents and volunteers. Any insurance, pooled coverage or self-insurance maintained by the Owner and its directors, officers, employees, agents and volunteers shall not contribute to it.

3. Any failure to comply with reporting or other provisions of the policies including breaches of warranties shall not affect coverage provided to the Owner and their directors, officers, employees, agents and volunteers.

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

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

D. Deductibles and Self-Insured Retentions – Any deductible or self-insured retention must be declared to and approved by the Owner. At the option of the Owner, either the insurer shall reduce or eliminate such deductibles or self-insured retentions.

E. Acceptability of Insurers – Insurance is to be placed with insurers having a current A.M. Best's rating of no less than A-: VII or equivalent.

<u>Workers' Compensation and Employer's Liability Insurance</u> – The CONTRACTOR and all SUBCONTRACTORs shall cover or insure under the applicable laws relating to workers' compensation insurance, all of their employees working on or about the construction site, regardless of whether such coverage or insurance is mandatory or merely elective under law, and the CONTRACTOR shall defend, protect and save harmless the Owner and its directors, officers, employees, agents and volunteers from and against all claims, suits, and actions arising from any failure of the CONTRACTOR or any SUBCONTRACTOR to maintain such insurance. Before beginning Work, CONTRACTOR shall furnish to the Owner satisfactory proof that CONTRACTOR has taken out for the period covered by the Work under this Contract, full compensation insurance for all persons employed directly by CONTRACTOR or through SUBCONTRACTORs in carrying out the Work contemplated under this Contract, all in accordance with the "Workers' Compensation and Insurance Act," Division IV of the Labor Code of the State of California and any Acts amendatory thereof.

The CONTRACTOR shall provide employer's liability insurance in the amount of, at least, $1,000,000 per accident for bodily injury and disease.

The CONTRACTOR shall provide the Owner with a certificate of Workers' Compensation and Employers liability insurance coverage.

In signing the Agreement, CONTRACTOR makes the following certification required by Section 1861 of the Labor Code:

"I am aware of the provisions of Section 3700 of the Labor Code which requires each employer to be insured against liability for workmen's compensation or to undertake self insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the Work of this Contract."

<u>Evidences and Cancellation of Insurance</u> – Prior to execution of the Agreement, the CONTRACTOR shall file with the Owner evidence of insurance from an insurer or insurers certifying to the coverage of all insurance required herein. Such evidence shall include original copies of the ISO CG 2010 (or insurer's equivalent) signed by the insurer's representative and certificate of insurance (Accord Form 25-S or equivalent). All evidence of shall be certified by a properly authorized officer, agent or qualified representative of the insurer and shall certify the names of the insured, any additional primary insurers, where appropriate, the type and amount of the insurance, the location and operations to which the insurance applies, the expiration date, and that the insurer will give by certified mail, written notice to the Owner at least thirty (30) days prior to the effective date of any cancellation, lapse or material change in the policy.

The CONTRACTOR shall, upon demand of the Owner, deliver to the Owner all such policy or policies of insurance and the receipts for payment of premiums thereon; and should the CONTRACTOR neglect to obtain and maintain in force any such insurance or deliver such policy or policies and receipts to the Owner, then it shall be lawful for the Owner to obtain and maintain such insurance, and the CONTRACTOR hereby appoints the Owner the true and lawful attorney-in-fact to do all things necessary for this purpose. All money paid by the Owner for insurance premiums under the provisions of this article shall be charged to the CONTRACTOR.

30. Contract Security

The CONTRACTOR shall, within ten (10) days after the receipt of the NOTICE OF AWARD, furnish the OWNER with a Performance Bond and a Payment Bond in penal sums equal to 100% of the CONTRACT PRICE, conditioned upon the performance by the CONTRACTOR of all undertakings, covenants, terms, conditions and agreements of the CONTRACT DOCUMENTS, and upon the prompt payment by the CONTRACTOR to all persons supplying labor and materials in the prosecution of the WORK provided by the CONTRACT DOCUMENTS. Such bonds shall be executed by the CONTRACTOR and corporate bonding company licensed to transact such business in the state in which the WORK is to be performed and named on the current list of "Surety Companies Acceptable Federal Bonds" as published in the Treasury Department Circular Number 570. The expense of these bonds shall be borne by the CONTRACTOR. If at any time a surety on any such bond is declared a bankrupt or loses its right to do business in the state in which the WORK is to be performed or is removed from the list of Surety Companies accepted on Federal bonds, CONTRACTOR shall within ten (10) days after notice from the OWNER to do so, substitute an acceptable bond (or bonds) in such form and sum and signed by such other surety or sureties as may be satisfactory to the OWNER. The premiums on such bond (s) shall be paid by CONTRACTOR. No further payments shall be deemed due nor shall be made until the new surety or sureties shall have furnished an acceptable bond to the OWNER.

Attached to the bonds shall be the original, or a certified copy, of the unrevoked appointment, power of attorney, bylaws or other instrument which entitles and authorizes the person to execute the bond to do so, a certified copy of the certificate of authority or the insurer issued by the Insurance Commissioner of the county in which the OWNER is located which would state that the certificate of authority of the insurer (the bonding company) has not been surrendered, revoked, cancelled, annulled, or suspended.

The Performance Bond shall remain in full force and effect during the Warranty period of 12 months from the date of acceptance of the work by the Owner.

If requested by the OWNER or ENGINEER, copies of the insurer's most recent annual statement and quarterly statement filed with the Department of Insurance pursuant to Article 10 (commencing with Section 900) of Chapter 1 of Part 2 of Division 1 of the Insurance Code, shall be provided to the OWNER or ENGINEER within 10 calendar days of the insurer's receipt of the request to submit the statements.

31. Assignments

Neither the CONTRACTOR nor the OWNER shall sell, transfer, assign or otherwise dispose of the Contract or any portion thereof, or of his right, title or interest therein, or his obligation thereunder, without written consent of the other party.

32. Indemnification

CONTRACTOR shall indemnify and hold harmless and defend the OWNER and the ENGINEER and their directors, officers, employees, agents or volunteers, and each of them from and against:

A. Any and all claims, demands, causes of action, damages, costs, expenses, losses or liabilities, in law or in equity, of every kind and nature whatsoever for, but not limited to, injury to or death of any person including OWNER and/or ENGINEER and/or CONTRACTOR, or any directors, officers, employees, agents volunteers of the OWNER, ENGINEER or CONTRACTOR, and damages to or destruction of property of any person, including but not limited to, OWNER, ENGINEER and/or CONTRACTOR and their directors, officers, employees, agents or volunteers arising out of or in any manner directly or indirectly connected with the work to be performed under this agreement, however caused regardless of any negligence of the OWNER of the ENGINEER of their directors, officers, employees, agents, or volunteers, except the sole negligence of willful misconduct or active negligence of the OWNER or the ENGINEER or their directors, officers, employees, agents or volunteers:

B. Any and all actions, proceedings, damages, costs, expenses, penalties or liabilities in law or equity, of every kind or nature whatsoever, arising out of , resulting from or on account of the violation of any governmental law or regulation, compliance with which is the responsibility of CONTRACTOR.

CONTRACTOR shall defend, at CONTRACTOR'S own cost, expense and risk, any and all such aforesaid suits, actions or other legal proceedings of every kind that may be brought or instituted against the OWNER and the ENGINEER or their directors, officers, employees, agents or volunteers.

CONTRACTOR shall pay and satisfy any judgment, award or decree that may be rendered against the OWNER and their directors, officers, employees, agents, or volunteers in any such suit, action or other legal proceedings.

CONTRACTOR shall reimburse the OWNER and their directors, officers, employees, agents and/or volunteers, for any and all legal expenses and costs incurred by them in connection therewith or in enforcing the indemnity herein provided.

CONTRACTOR agrees to carry insurance for this purpose as set out in the specifications. See Paragraph 29 of these General Provisions for insurance specifications and coverage. CONTRACTOR'S obligation to indemnify shall not be restricted to insurance proceeds, if any, received by the OWNER and the ENGINEER or their directors, officers, employees, agents and/or volunteers.

33. Separate Contracts

The OWNER reserves the right to let other contracts in connection with this PROJECT. The CONTRACTOR shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their WORK, and shall properly connect and coordinate his WORK with theirs. If the proper execution or results of any part of the CONTRACTOR'S work depend upon the work of any other contractor, the CONTRACTOR shall inspect and promptly report to the ENGINEER any defects in such WORK that render it unsuitable for such proper execution and results.

The OWNER may perform additional WORK related to the PROJECT by himself, or he may let other contracts containing provisions similar to these. The CONTRACTOR will afford the CONTRACTORs who are parties to such contracts (or the OWNER, if he is performing the additional WORK himself), reasonable opportunity for the introduction and storage of materials and equipment and the execution of WORK, and shall properly connect and coordinate his WORK with theirs.

In the performance of additional WORK by other contractors or the OWNER is not noted in the CONTRACT DOCUMENTS prior to the execution of the Agreement, written notice thereof shall be given to the CONTRACTOR prior to starting any such additional WORK. If the CONTRACTOR believes that the performance of such additional expense or entitles him to an extension of the CONTRACT TIME, he may make a claim therefore as provided in Items 16 and 17 of these General Provisions.

34. Subcontracting

The CONTRACTOR may utilize the services of specialty SUBCONTRACTORS on those parts of the WORK which, under normal contracting practices, are performed by specialty SUBCONTRACTORS.

The CONTRACTOR shall be fully responsible to the OWNER for the acts and omissions of his SUBCONTRACTORS, and of persons either directly or indirectly employed by them, as he is of the acts and omissions of persons directly employed by him.

The CONTRACTOR shall cause appropriate provisions to be inserted in all contracts relative to the WORK to bind SUBCONTRACTORS to the CONTRACTOR by the terms of the CONTRACT DOCUMENTS in so far as applicable to the WORK of SUBCONTRACTORS and to give the CONTRACTOR the same power as regards terminating any subcontract that the OWNER may exercise over the CONTRACTOR under any provision of the CONTRACT DOCUMENTS.

Nothing contained in this CONTRACT shall create any contractual relation between any SUBCONTRACTOR and the OWNER.

CONTRACTOR shall include all SUBCONTRACTORS as insured under its policies or shall furnish separate certificates and endorsements for each SUBCONTRACTOR. All coverage for SUBCONTRACTORS shall be subject to all of the requirements stated herein.

35. Employment of Apprentices

The CONTRACTOR and any SUBCONTRACTOR under him shall comply with the requirements of Sections 1777.5 and 1777.6 of the Labor Code in the employment of apprentices. The responsibility for compliance with the provisions of said Section 1777.5 for all apprenticeship occupations shall rest with the CONTRACTOR. Information relative to apprenticeship standards, wage schedules and other requirements may be obtained from the Division of Apprenticeship Standards, 455 Golden Gate Avenue, San Francisco, California, or from its branch offices.

36. Payment of Prevailing Wages

The CONTRACTOR and all SUBCONTRACTORs under him shall pay all laborers, workmen and mechanics on all work included in this contract no less than the general prevailing rate of per diem wages for work performed, (to-wit, within the limits of the City), and no less than the general prevailing rate of per diem wages for legal holiday and overtime work in said locality, which per diem wages shall not be less than the stipulated rate contained in a schedule thereof which has been ascertained and determined by the Council to be the general prevailing rate of per diem wages for each craft or type of workman or mechanic needed to execute this contract, and which is now on file with the City Clerk, as set forth in the Information for Bidders, and by reference it is incorporated herein and made a part hereof.

The CONTRACTOR shall forfeit, as a penalty to the OWNER, two hundred dollars ($200.00) for each laborer, workman or mechanic employed for each calendar day or portion thereof such laborer, workman or mechanic is paid less than the said stipulated rates for any work done under this contract by him or by any SUBCONTRACTOR under him in violation of Articles 1 and 2 of Chapter 1 Part 7 of Division 11 of the Labor Code of the State of California, and said sums and amounts which shall have been so forfeited pursuant to the herein paragraph and the said terms of said Labor Code shall be withheld and retained from payments due to the CONTRACTOR under said contract, pursuant to this contract and the said terms of said Labor Code; but no sum shall be so withheld, retained or forfeited except from the final payment without a full investigation by either the Division of Labor law Enforcement of the State Department of Industrial Relations or by said Council.

The difference between such stipulated prevailing wage rates and the amount paid to each workman for each calendar day, or a portion thereof, for which each workman was paid less than the stipulated prevailing wage rate shall be paid to each workman by the CONTRACTOR. The CONTRACTOR shall comply with the provisions of Section 1775 of the Labor Code of the State of California.

The CONTRACTOR and his SUBCONTRACTORS shall submit certified payroll information electronically to the Department of Industrial Relations as well as a hard copy of said certified payrolls to the OWNER on a monthly basis.

37. Registration to Train Apprentices

Pursuant to Labor Code Section 1777.5, all CONTRACTORs shall file with the appropriate Joint Apprenticeship Training Committee, a DAS-140 form registering to train apprentices. This requirement to register to train apprentices is mandated by Section 1777.5 whether or not you are signatory to or a party of any approved training program. Only those programs approved by the California Apprenticeship Council are applicable to accept DAS-140 registration forms.

If the CONTRACTOR is approved to train apprentices, then apprentices must be called in a ratio not less than one apprentice hour for each five journeyman hours.

However, if the entire contract may be completed within 20 working days or the entire contract (nor subcontracts) is less than thirty thousand ($30,000), then the CONTRACTOR is exempt from requesting apprentices under Labor Code Section 1777.5.

In addition, all CONTRACTORs are required to make appropriate training contributions as set forth in the prevailing wage determination to each appropriate JATC, or in the alternative, to the California Apprenticeship Council. Payments shall be made not less than monthly, calculated and paid by the fifteenth of each month, for work performed that prior month.

The address for the applicable Joint Apprenticeship Training Committee and for the California Apprenticeship Council can be obtained by calling the Division of Apprenticeship Standards.

38. Penalties

Failure to pay the appropriate prevailing wage can result in penalties being assessed as follows:

A. Up to $50.00 per day per worker for each and every violation; and,

B. debarment from future public works for a period not to exceed three years.

C. $50.00 per day per worker for each failure to comply with the payment of overtime for all hours worked in excess of 8 in one day or 40 in one week.

Failure to register to train apprentices or failure to pay the appropriate training contribution can result in penalties being assessed as follows:

A. $100.00 per day for each day of violation; and,

B. debarment from future public works for a period not to exceed three years.

39. Engineer’s Authority

The ENGINEER shall act as the OWNER’S representative. He shall decide questions which may arise as to quality and acceptability of materials furnished and WORK performed. He shall interpret the intent of the CONTRACT DOCUMENTS in a fair and unbiased manner. The ENGINEER will make visits to the site and determine if the WORK is proceeding in accordance with the CONTRACT DOCUMENTS.

The CONTRACTOR will be held strictly to the intent of the CONTRACT DOCUMENTS in regard to the quality of materials, workmanship and execution of the WORK. Inspections may be made at the factory or fabrication plant of the source of material supply.

The ENGINEER will not be responsible for the construction means, controls, techniques, sequences, procedures, or construction safety.

40. Land and Rights-of-Way

Prior to issuance of the NOTICE TO PROCEED, the OWNER shall obtain all land and rights-of-way necessary for carrying out and for the completion of the WORK to be performed pursuant to the CONTRACT DOCUMENTS, unless otherwise mutually agreed.

The OWNER shall provide to the CONTRACTOR information which delineates and describes the lands owned and rights-of-way acquired.

The CONTRACTOR shall provide, at his own expense and without liability to the OWNER, any additional land and access thereto that the CONTRACTOR may desire for temporary construction facilities, or for storage of materials.

41. Warranty and Guarantee

CONTRACTOR warrants and guarantees to OWNER that all work will be in accordance with the Contract Documents and will not be defective. Prompt notice of defects known to OWNER shall be given to CONTRACTOR. All defective work, whether or not in place, may be rejected, corrected or accepted as provided in Paragraph 19, Changes in the Work, of these General Provisions. Defective work may be rejected even if approved by prior inspection.

42. One (1) Year Warranty Period

The warranty period shall commence when the Notice of Completion is issued, at notice of beneficial occupancy or at notice of partial utilization of the work to be warranted has been issued, or a later date if so specified in the AGREEMENT, or mutually agreed to, and extend until one (1) year after that date or whatever longer period may be prescribed by laws or regulations or by the terms of any applicable special guarantee or specific provision of the CONTRACT DOCUMENTS.

43. Correction of Defective Work

If within the designated warranty period, or such longer period as may be required by Laws or Regulations, the WORK, or any part of the WORK, is discovered to be defective, CONTRACTOR shall promptly, without an adjustment in CONTRACT PRICE and in accordance with OWNER's written instructions, either correct that defective WORK, or if it has been rejected by OWNER, remove it from the site and replace it with non-defective WORK. If circumstances warrant it, including but not limited to, in an emergency, OWNER may have the defective WORK corrected or the rejected WORK removed and replaced. In that event, CONTRACTOR shall not be allowed to recover any associated costs, and he shall reimburse OWNER for all direct, indirect and consequential costs of OWNER, and OWNER shall be entitled to an appropriate decrease in CONTRACT PRICE, to withhold a set-off against amount recommended for payment, or make a claim on CONTRACTOR's bond if CONTRACTOR has been paid in full. Where defective WORK (and damage to other WORK resulting therefrom) has been corrected, removed or replaced during the warranty period, the one (1) year warranty period with respect to such WORK will be extended for an additional period of one (1) year after such correction or removal and replacement has been satisfactorily completed.

44. Early Completion

The one (1) year warranty period will not begin until the Notice of Completion is filed. If CONTRACTOR completes the WORK or portions thereof prior to this time, he shall preserve the equipment and/or facilities by developing and implementing a preventive maintenance program in compliance with manufacturer's recommendations to maintain the equipment and/or facilities unless OWNER has issued a notice of beneficial occupancy or notice of partial utilization for the warranted WORK. At start up, CONTRACTOR will be required to get his equipment and/or facilities ready to put into service.

45. Extended Warranties and Guarantees

OWNER may at its sole discretion extend the one (1) year warranty period up to twenty-four (24) months, in which case CONTRACTOR shall maintain the warranties and guarantees. If such extension of the one (1) year warranty period causes an increase in the cost of the warranties and guarantees provided by CONTRACTOR, an adjustment in Contract Price shall be made as provided by the CONTRACT DOCUMENTS.

46. Arbitration

With the prior approval of the OWNER and the CONTRACTOR, all claims, disputes and other matters in question arising out of, or relation to, the CONTRACT DOCUMENTS or the breach thereof, except for claims which have been waived by the making and acceptance of final payment as provided by Item 24 of these General Provisions, may be decided by arbitration in accordance with the Arbitration Rules of the American Arbitration Association. If entered into, the agreement to arbitrate shall be specifically enforceable under the prevailing arbitration law. The award rendered by the arbitrators shall be final, and judgment may be entered upon it in any court having jurisdiction thereof.

Notice of the request for arbitration shall be filed in writing with the other party to the CONTRACT DOCUMENTS and with the American Arbitration Association, and a copy shall be filed with the ENGINEER. The request for arbitration shall set forth specifically the dispute to be arbitrated. Acceptance by the other party of the request to arbitrate shall constitute the agreement to arbitrate and arbitration shall proceed forthwith. No legal proceedings other than to enforce arbitration shall be commenced on any issue covered by the arbitration agreement.

The CONTRACTOR shall carry on the WORK and maintain the progress schedule during any arbitration proceedings, unless otherwise mutually agreed in writing.

47. Taxes

The CONTRACTOR shall pay all sales, consumer, use and other similar taxes required by the law of the place where the WORK is performed.

48. Contractor’s Understanding

It is understood and agreed that the CONTRACTOR has, by careful examination, satisfied himself as to the nature and extent of the WORK, the character, quality, and quantity of the materials to be encountered, the character of the equipment and facilities needed preliminary to and during the prosecution of the WORK, the general and local conditions, and all other matters which can in any way affect the WORK under this Contract. No verbal agreement or conversation with any officer, agent or employee of the ENGINEER or the OWNER, either before or after the execution of this Agreement, shall affect or modify any of the terms or obligations herein contained.

49. Accidents

The CONTRACTOR shall provide, at the site, such equipment and medical facilities as are necessary to supply first-aid service to anyone who may be injured in connection with the WORK. The CONTRACTOR must 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 causes death, personal injury, or property damages, giving full details and statements of witnesses. In addition, if death or serious injuries or serious damages are caused, the accident shall be reported immediately by telephone or messenger to both the ENGINEER and the OWNER. 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.

50. Safety and Sanitation

The CONTRACTOR shall provide adequate safety and sanitation facilities according to State laws and local ordinances.

The CONTRACTOR will assume sole and complete responsibility for job site conditions during the course of construction of the project, including safety of all persons and equipment. This responsibility shall apply continuously and not be limited to normal working hours.

51. Climatic Conditions

The ENGINEER may order the CONTRACTOR to suspend any WORK that may be subject to damage by climatic conditions. The CONTRACTOR may suspend WORK if climatic conditions are such that the CONTRACTOR is unable to work. In such case, the CONTRACTOR, within seven days, shall request in writing a CHANGE ORDER to extend the CONTRACT TIME.

52. Officials Not To Benefit

No official of the OWNER shall receive any benefit that may arise by reason of this Contract.

53. Clean-Up

During the progress of the WORK, the CONTRACTOR shall maintain the site and related structures and equipment in a clean, orderly condition and free from unsightly accumulations of rubbish. Upon completion of the WORK, the CONTRACTOR shall remove from the vicinity of the WORK all plants, buildings, rubbish, unused materials, concrete forms, temporary bridging, and other like material, belonging to him or used under his direction during construction, and in the event of his failure to do so, the same may be removed by the OWNER after 10 calendar days notice to the CONTRACTOR at the expense of the CONTRACTOR, and his surety or sureties shall be liable therefore.

As part of the final clean-up, the CONTRACTOR shall dress up and grade the right-of-way to match existing ground surfaces, and shall remove therefrom all weeds and other growth. Where the construction has crossed yards or driveways, they shall be restored to a condition equivalent to the condition existing prior to the construction as determined by the ENGINEER.

No direct payment will be made to the CONTRACTOR for any clean-up work, but all compensation therefore shall be included in the prices bid in the schedule for the various items of work.

54. Notice to Owner

In the event this contract involves digging trenches or excavations that extend deeper that four feet below the surface, the CONTRACTOR shall promptly, and before the following conditions are disturbed, notify OWNER, in writing, of any:

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

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

C. Unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the contract.

OWNER shall promptly investigate the conditions. If OWNER finds that the conditions do materially so differ, or do involve hazardous waste, and cause a decrease or increase in the CONTRACTOR'S cost of, or the time required for, performance of any part of the WORK, OWNER shall issue a CHANGE ORDER under the procedures described in the contract.

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

55. Payment of Withheld Funds

The Owner shall retain 5**%** of each payment from CONTRACTOR and shall make prompt and regular incremental acceptances of portions, as determined by the Owner, of the Contract Agreement Work, and pay retention to the CONTRACTOR based on these acceptances. The CONTRACTOR, or SUBCONTRACTOR, shall return all monies withheld in retention from a SUBCONTRACTOR within 30 days after receiving payment for Work satisfactorily completed and accepted including incremental acceptances of portions of the Contract Agreement Work by the Owner. Federal law (49CFR26.29) requires that any delay or postponement of payment over 30 days may take place only for good cause and with the Owner's prior written approval. Any violation of this provision shall subject the violating CONTRACTOR or SUBCONTRACTOR to the penalties, sanctions and other remedies specified in Section 7108.5 of the Business and Professions Code. These requirements shall not be construed to limit or impair any contractual, administrative, or judicial remedies otherwise available to the CONTRACTOR or SUBCONTRACTOR in the event of a dispute involving late payment or nonpayment by the CONTRACTOR, deficient subcontract performance, or noncompliance. When the Work is complete, the Owner will issue a Notice of Completion to the County. The Owner will pay all retention funds to the CONTRACTOR thirty-five (35) Days after Notice of Completion has been recorded.

56. Storm Water Pollution Prevention Measures

Storm Water Pollution Prevention Measures shall be performed in accordance with the provisions in Section 13-3, "Storm Water Pollution Prevention Plan," of the Standard Specifications.

A. <u>GENERAL</u>

In compliance with the State and Federal regulations regarding storm water management during construction, the CONTRACTOR shall not allow any debris, waste materials or pollutants, originating from the CONTRACTOR's operations, to enter the storm drainage system, which leads to contamination of local creeks and ponding basins.

The CONTRACTOR shall properly dispose of all wastes and excess materials in a legal manner to the satisfaction of the Owner.

B. <u>SELECTIVE BMPS FOR STORM WATER POLLUTION PREVENTION</u>

As applicable to the project or directed by the Engineer, the CONTRACTOR shall implement any or all of the following Best Management Practices (BMPs):

1. <u>Material Handling and Storage</u>

a. <u>Nonhazardous Materials</u>

i. Designated Delivery and Storage Area

The CONTRACTOR shall propose areas in the vicinity of or within the project site or within the CONTRACTOR's staging site, which are suitable for material delivery and storage. To the maximum extent practicable, these areas shall be away from gutters, catch basins, drainage courses or creeks. The CONTRACTOR shall submit the proposed areas to and shall obtain the approval from the Engineer in writing prior to bringing in materials.

ii. Storage of Granular Materials

The CONTRACTOR shall store granular materials at least ten feet (10') away from any inlet or curb return and shall prevent the granular materials from entering the storm drain system, drainage courses or creeks. During wet weather or when rain is forecast within 24 hours, the CONTRACTOR shall cover granular materials with a tarpaulin and surround the material with sandbags or other approved heavy objects.

b. Hazardous Materials

i. Hazardous materials include, but are not limited to, petroleum products, antifreeze, paints, thinners, solvents, pesticides, herbicides and various other toxic chemicals.

ii. The CONTRACTOR shall propose, within the project site or the CONTRACTOR's staging site, an area that is suitable for hazardous material delivery and storage. To the maximum extent practicable, the area shall be away from inlets, gutters, drainage courses or creeks. The CONTRACTOR shall submit the proposed area to and shall obtain approval from the Engineer in writing prior to bringing in hazardous materials.

iii. The CONTRACTOR shall label and store all hazardous materials and hazardous wastes in accordance with secondary containment regulations, the City of Los Banos Hazardous Materials Storage Ordinance and all applicable Merced County, State and Federal laws and regulations.

iv. The CONTRACTOR shall keep all hazardous materials or waste in containers and fully covered to avoid contamination of storm runoff.

v. The CONTRACTOR shall keep an accurate, up-to-date inventory, including Materials Safety Data Sheets (MSDSs), of hazardous materials and hazardous wastes stored on-site to assist emergency response personnel in the event of a hazardous material incident.

2. Hazardous Material Usage

a. The CONTRACTOR shall follow all local, State and Federal policies, laws and regulations governing the use of hazardous materials.

b. The CONTRACTOR shall use only Category III pesticides for pest control. If Category III pesticides are unavailable, have been tried but proven ineffective, or when it is necessary to prevent a pest outbreak that poses an immediate threat to public health or significant economic loss, the City may consider allowing the use of Category II pesticides with a dose of up to LD50 (a dose that kills 50 percent of the targeted pest population in the laboratory) provided that the risk to the applicator and impact to the environment can be justified. Use of Category I pesticides is prohibited.

c. Apply pesticides at the appropriate time to maximize their effectiveness and minimize the likelihood of discharging non-degraded pesticides into storm water system, drainage courses and creeks.

d. Mix only as much material as is necessary for treatment. Calibrate application equipment prior to and during use to ensure desired application rate. Do not mix or load pesticides adjacent to storm drain system, drainage courses or creeks.

e. The CONTRACTOR shall not overapply herbicides, pesticides or fertilizers and shall follow the manufacturer's instructions regarding uses, protective equipment, ventilation, flammability and mixing of chemicals. Over-application of a pesticide is a "label violation" subject to an enforcement action by the Merced County Agriculture Department.

f. When rain is forecast within 24 hours or during wet weather, the CONTRACTOR shall not apply chemicals in outside areas unless otherwise allowed by the Engineer in writing.

3. Integrated Pest Management Methods

The CONTRACTOR shall employ, in place of pesticides, integrated pest management methods including:

a. No control

b. Physical or mechanical methods

c. Least toxic chemicals (insecticidal soaps and oil, etc.)

4. Vehicle and Equipment Cleaning, Maintenance and Fueling

a. Cleaning

The CONTRACTOR shall not clean or wash vehicles or equipment on- site or in the streets. If allowed by the Engineer in writing, cleaning and washing shall be performed in a designated and bermed area approved by the Engineer using water only. No soaps, solvents, degreasers, steam cleaning equipment or similar methods are permitted. The CONTRACTOR shall not allow wash water to flow into streets, gutters, storm drain system, drainage courses or creeks.

b. Maintenance and Fueling

i. The CONTRACTOR shall perform maintenance and fueling of vehicles or equipment in a designated, bermed area or over a drip pan that will prevent waste, leaks or spills from entering streets, gutters, storm drain system, drainage courses or creeks.

ii. The CONTRACTOR shall inspect all vehicles and equipment arriving on-site for leaking fluids and shall promptly repair leaking vehicles and equipment. Drip pans shall be used to catch leaks until repairs can be made. Shut-off valves on equipment must be working properly.

5. Spill Prevention and Control

a. If hazardous materials are used on the project, the CONTRACTOR shall keep a stockpile of spill clean-up materials, such as rags or absorbents, readily accessible on-site.

b. Above-ground storage tanks and their installations shall comply with City, State and Federal requirements.

c. The CONTRACTOR shall immediately contain and prevent spills or leaks from entering storm drain system, drainage courses or creeks and shall properly clean up and dispose of the spills or leaks. The CONTRACTOR shall not wash the spills or leaks into streets, gutters, storm drain system, drainage courses or creeks and shall not bury the spills or leaks.

d. In case of a hazardous material spillage, the CONTRACTOR shall immediately call 911 and shall handle the spilled material in accordance with the requirements of 6, “Disposal of Hazardous Waste,” below.

6. Disposal of Hazardous Waste

a. Unless the CONTRACTOR is a licensed hazardous waste handler, the CONTRACTOR shall contract with a licensed hazardous waste handler to remove and dispose of hazardous waste materials unless the waste quantities to be transported are below threshold limits for transportation as specified in the State and Federal regulations.

b. The CONTRACTOR shall arrange for regular hazardous waste collection to comply with limits for storage of hazardous waste.

c. The CONTRACTOR may dispose of dry, empty paint cans, buckets, paintbrushes, rollers, rags and drop cloths in the trash.

d. The CONTRACTOR shall dispose of hazardous waste at facilities authorized for treatment, storage and disposal of hazardous waste only.

7. Street Sweeping

At the end of each day or as directed by the Engineer, the CONTRACTOR shall sweep roadways of all debris and excess materials attributed to the CONTRACTOR's operations.

8. Water Usage

a. The CONTRACTOR shall use the least amount of water necessary for dust control and street sweeping operations.

b. The CONTRACTOR shall not use water to flush dust and debris down the street in place of street sweeping.

9. Dumpsters and Portable Sanitary Facilities

a. If dumpsters or portable sanitary facilities are used, they shall be stationed at least ten feet (10') away from storm drain facilities.

b. The CONTRACTOR shall arrange for regular waste collection to keep dumpsters and portable sanitary facilities from overflowing and shall regularly inspect these facilities for leaks. If a leak is discovered, the CONTRACTOR shall arrange for the repair or replacement of facilities that leak. The CONTRACTOR shall not wash the dumpsters or portable sanitary facilities on-site.

10. Earthwork

The CONTRACTOR shall maximize the control of erosion and sediment by using the Best Management Practices for erosion and sedimentation control described in the California Storm Water Best Management Practice Handbook—Construction Activity or ABAG Manual of Standards for Erosion and Sediment Control Measures.

11. Dewatering

a. The CONTRACTOR shall route water through a control device, such as a sediment trap, sediment basin or Baker tank, to remove settleable solids prior to discharging the water into the storm drain system. Refer to the California Storm Water Management Practice Handbook for these sediment control measures.

b. Approval of the control device shall be obtained in advance from the Engineer.

c. Filtration of the water following the control device may be required on a case-by-case basis.

d. If the Engineer determines that the dewatering operation would not generate an appreciable amount of settleable solids, the control device may be waived.

12. Saw Cutting

a. During saw cutting or grinding operation, use as little water as possible.

b. During saw cutting, the CONTRACTOR shall cover or barricade catch basins using filter fabric, straw bales, sandbags or fine gravel dams to keep slurry out of the storm drain system. When protecting a catch basin, the CONTRACTOR shall ensure that the entire opening of the catch basin is covered. Refer to California Storm Water Best Management Practice Handbook for these control measures.

c. The CONTRACTOR shall shovel, absorb or vacuum saw cut slurry and pick up the waste as the work progresses prior to moving to the next location, as specified elsewhere in these specifications or as directed by the Engineer.

d. If saw cut slurry enters catch basins, the CONTRACTOR shall, at the CONTRACTOR's cost, clean up the storm drain system immediately.

13. Concrete, Grout and Mortar Related Work

a. Material Handling

i. The CONTRACTOR shall avoid mixing excess amounts of fresh concrete or cement mortar on-site.

ii. The CONTRACTOR shall store concrete, grout and mortar away from storm drain facilities or drainage courses and shall ensure that these materials do not enter the storm drain system.

b. Washing of Concrete Truck and Tools

i. The CONTRACTOR shall not wash out concrete trucks or equipment into streets, gutters, storm drain system, drainage courses or creeks.

ii. The CONTRACTOR shall perform washing of concrete trucks and tools off-site or in a designated area on-site where the water will flow onto dirt or into a temporary pit in a dirt area. The CONTRACTOR shall let the water percolate into the soil and dispose of the hardened concrete in a trash container. If a suitable dirt area is not available, the CONTRACTOR shall collect the wash water and dispose of it off-site.

14. Asphalt Concrete Paving

a. Project Site Management

i. When rain is forecast within 24 hours or during wet weather, the Engineer may prevent the CONTRACTOR from paving.

ii. The Engineer may direct the CONTRACTOR to protect drainage courses by using earth dike, straw wattle or sandbag to trap and filter sediment. Refer to California Storm Water Best Management Practice Handbook for these control measures.

iii. The CONTRACTOR shall place drip pans or absorbent material under paving equipment when not in use.

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

v. If the paving operation includes an on-site mixing plant, the CONTRACTOR shall comply with Merced County NPDES General

Industrial Activities Storm Water Permit requirements.

vi. The CONTRACTOR shall preheat, transfer or load hot bituminous material away from storm drain system, drainage courses or creeks.

b. Paving Waste Management

The CONTRACTOR shall not sweep or wash down excess sand (placed as part of a sand seal or to absorb excess oil) into streets, gutters, storm drain system or creeks but shall collect the sand and dispose of it off-site. The CONTRACTOR shall not wash fresh asphalt concrete pavement.

15. <u>Painting</u>

a. General

i. The CONTRACTOR shall remove as much excess paint as possible from brushes, rollers and other tools before starting cleanup.

ii. The CONTRACTOR shall conduct cleaning of painting equipment and tools in a designated area approved by the Engineer.

iii. The CONTRACTOR shall not allow wash water from cleaning of painting equipment and tools into streets, gutters, storm drain system, drainage courses or creeks.

b. Water-Based Paint

To the maximum extent practicable, the CONTRACTOR shall dispose of wash water from water cleaning of brushes, rollers and other tools used in water-based painting work to the sanitary sewer or direct wash water onto dirt area and spade in.

c. Oil-Based Paint

The CONTRACTOR shall dispose of waste thinner and solvent and sludge from cleaning of brushes, rollers and other tools used in oil- based painting work as hazardous waste and the CONTRACTOR shall handle the waste as described in Section 6, “Disposal of Hazardous Waste,” above. To the maximum extent practicable, the CONTRACTOR shall filter paint thinner and solvents for reuse.

16. <u>Thermoplastic</u>

a. The CONTRACTOR shall transfer and load hot thermoplastic away from drainage systems or drainage courses or creeks.

b. The CONTRACTOR shall sweep thermoplastic grindings into plastic bags. Yellow thermoplastic grindings may require special handling as they may contain paint.

C. <u>CONTRACTOR TRAINING AND AWARENESS</u>

1. The CONTRACTOR shall train all employees and SUBCONTRACTORs on the storm water pollution prevention requirements contained in these specifications.

2. The CONTRACTOR shall inform SUBCONTRACTORs of the storm water pollution prevention contract requirements and include appropriate subcontract provisions to ensure that these requirements are met.

3. The CONTRACTOR shall post warning signs in areas treated with chemicals.

D. <u>BMP IMPLEMENTATION</u>

The CONTRACTOR shall be responsible throughout the duration of the construction period for installing and maintaining the applicable BMPs and for removing and legally disposing of temporary control measures. Unless otherwise directed by the Engineer or specified elsewhere in these specifications, the CONTRACTOR's responsibility for BMP implementation shall continue throughout any temporary suspension of work ordered in conformance with the provisions in Section 8-1.06, "Suspensions," of the Standard Specifications.

Throughout the rainy season, all soil-disturbed areas of the site shall be fully protected with soil stabilization and sediment control device approved by the Engineer at the end of the same day the soil is disturbed unless fair weather is predicted the next day and the protective measures are exempt by the Engineer. The CONTRACTOR shall monitor the weather forecast on a daily basis and inform the Engineer of the forecast. The National Weather Service forecast shall be used for this purpose. If precipitation is predicted for the following day, construction schedule shall be altered as required to install appropriate BMPs or to ensure that the already installed BMPs are in good operating condition prior to the onset of rain.

E. <u>BMP MAINTENANCE</u>

To ensure proper implementation and effectiveness of the BMPs, the CONTRACTOR shall regularly inspect and maintain the deployed BMPs throughout the construction site. The CONTRACTOR shall identify corrective actions and the time needed to address any deficient BMPs or reinitiate any BMPs that have been discontinued. The CONTRACTOR shall keep written records of all BMP inspections, maintenance and corrective actions.

The frequency of the BMP inspection shall be as follows:

1. Prior to a forecast storm;
2. After any precipitation that causes runoff;
3. At 24-hour intervals during extended rain events; and
4. Routinely, at a minimum of once every week.

If the CONTRACTOR or the Engineer identifies a deficiency in the deployment or functioning of a BMP, the deficiency shall be corrected immediately. If requested by the CONTRACTOR and approved by the Engineer in writing, the deficiency may be corrected at a later time or date but the corrective action shall not be later than the onset of the subsequent rain event. The correction of deficient BMPs shall be at no additional cost to the City.

F. <u>RESPONSIBILITIES, CONSEQUENCES, AND REMEDIES</u>

1. Conformance with the provisions of this section or other requirements in various other sections of these specifications shall not relieve the CONTRACTOR from the CONTRACTOR's responsibilities as provided in various relevant articles of Section 7, "Legal Relations and Responsibilities to the Public," of the Standard Specifications, and as specified herein.
2. For purposes of this section, costs and liabilities include, but are not limited to, fines, penalties and damages, whether assessed against the City or the CONTRACTOR, including those levied under the Federal Clean Water Act and the State Porter-Cologne Water Act.
3. If solid or liquid materials or waste, hazardous or otherwise, or pollutants originating from the CONTRACTOR's operation enter the storm drain system or water courses, the CONTRACTOR will be required to thoroughly clean up the affected storm drain facilities and water courses to the satisfaction of the Engineer. If the CONTRACTOR fails to clean up the affected facilities as required, the City will issue a stop-work order and take necessary actions to effect the cleanup of the affected facilities.
4. The CONTRACTOR shall be responsible for all costs, including fines, the City's cost of defense, the cost of cleanup by others ordered by the City, and liabilities imposed by law as a result of the CONTRACTOR's failure or

negligence in complying with the requirements specified herein.

5. In accordance with the provisions of Section 7-1.05, “Indemnification,” of the standard Specifications if the CONTRACTOR fails to accept or reject a tender of defense and indemnity within fifteen (15) calendar days, the City may, in addition to the remedies authorized by law, retain any sum due the CONTRACTOR until disposition has been made of all claims or suits for damages or until the CONTRACTOR accepts or rejects the tender of defense, whichever occurs first.

G. PAYMENT

Full compensation for storm water pollution control shall be considered as included in the payment for various other items of work and no additional compensation will be made therefore.

Special Provisions

1. Requirements

It is required that there be constructed and completed in accordance with the CONTRACT DOCUMENTS for "Construction of **JO-LIN SEWER LIFT STATION REHABILITATION**" for the City of Los Banos, all WORK as described in these CONTRACT DOCUMENTS.

2. Description of Work

The principal components of the WORK to be performed under these CONTRACT DOCUMENTS include the following:

The major WORK consists of the rehabilitation of an existing sanitary sewer lift station located at 2088 Greenbriar Drive; in the City of Los Banos. Improvements will include the removal of existing electrical controls and conduit, lift station pumps and appurtenances; the installation of submersible pumps and appurtenances, onsite piping, electrical service and motor control center, reconfiguration of existing wet well bottom, installation of protective lining to existing wet well, temporary sewer bypass pumping as required and removal and replacement of curb, gutter, sidewalk and asphalt above proposed underground improvements.

Any incidental WORK not described in the CONTRACT DOCUMENTS which is necessary to complete the WORK shall be furnished and installed as part of this CONTRACT at no additional cost to the OWNER. The WORK shall be complete and ready for service to the satisfaction of the OWNER. The CONTRACTOR shall have had the opportunity to inspect the site and observe actual working conditions during the mandatory pre-bid meeting.

3. Commencement, Prosecution and Completion of Work

The CONTRACTOR shall commence WORK and shall complete all of the WORK in accordance with the schedule and within the time stated in the BID. The capacity of the CONTRACTOR'S construction plant, sequence of operations, method of operations, and the forces employed shall at all times during the continuance of the Contract, be subject to the approval of the ENGINEER and shall be such as to ensure the completion of the WORK within the time specified.

4. Hours of Work

Construction work shall be completed between the hours of 7:00 a.m. and 9:00 p.m. Monday through Friday using normal construction practices. No WORK shall be performed on Saturday or Sunday. The CONTRACTOR may request to the OWNER to perform construction outside of these specified hours.

5. Permits and Business Licenses

The CONTRACTOR will need an Encroachment Permit from the Public Works Department prior to start of construction. The CONTRACTOR and all SUBCONTRACTORS working within the city limits of Los Banos shall apply for and have issued a Business License from the City of Los Banos (209-827-7000) prior to commencement of WORK.

6. Responsibility Regarding Existing Utilities and Private Property

The existence and location of public and private utilities indicated on the DRAWINGS are not guaranteed and any additional utilities and facilities not shown on the DRAWINGS shall be investigated and protected by the CONTRACTOR. The CONTRACTOR shall be held responsible for damage to and for maintenance and protection of existing pipelines, public utilities, drives, curbs and gutters, sidewalks, and fences. Excavation in the vicinity of existing public utility structures, underground electrical or telephone cable, oil or gas pipelines, and waterlines shall be carefully done by hand. The CONTRACTOR shall adequately protect all adjoining property and structures from damage, whether within or without of the OWNER furnished rights-of-way, and shall be fully responsible for any damage to adjoining property and structures which may result from WORK done under this Contract. The CONTRACTOR shall use extreme care during construction to prevent damage from dust to crops and adjacent property. The CONTRACTOR shall sprinkle the areas where the passage of operation of vehicles and equipment creates a dust problem, or take other preventive measures as directed by the ENGINEER. The CONTRACTOR shall furnish all labor, equipment, materials and means required to control dust which is in any way a result of the CONTRACTOR'S operations.

The CONTRACTOR shall be responsible for all damage or injury which may result to any property, outside of the construction right-of-way or within the right-of-way where so noted, from the CONTRACTOR'S operations hereunder, or otherwise, from the performance of the Agreement by said CONTRACTOR or any of his SUBCONTRACTORs or employees.

The CONTRACTOR shall attempt to maintain access to the residential and commercial driveways within the construction area at all times during working hours and shall provide access during non-working hours, weekends and holidays.

Payment for all WORK specified above shall be included in the unit or lump sum prices bid in the schedule for the various items of WORK.

7. Obstructions

The CONTRACTOR shall notify the ENGINEER and the appropriate regional notification center for operators of subsurface installation at least 3 working days, but not more than 14 calendar days, prior to performing any excavation or other work close to any underground pipeline, conduit, duct, wire or other structure. Failure to contact the notification center prohibits excavation. Regional notification centers include but are not limited to the following:

NOTIFICATION CENTER	TELEPHONE
Underground Service Alert Northern California (USA) www.usanorth811.org	811 or 1-800-227-2600

8. Materials Furnished By Owner

No labor, material, or other facilities shall be provided by the OWNER unless otherwise indicated on the DRAWINGS or in the CONTRACT DOCUMENTS.

9. Materials Furnished By Contractor

Unless otherwise stipulated, the CONTRACTOR shall provide and pay for all materials, labor, water, tools, equipment, light, power, transportation, and other facilities necessary for the execution and completion of the WORK.

10. Schedule of Values, Material List and Substitutions

Prior to the commencement of WORK, and within 10 days following the signing of the Contract by the CITY and the CONTRACTOR, the CONTRACTOR shall submit a Schedule of Values for all lump sum bid items in the Proposal and a *complete* list of equipment and materials to be furnished, including all substitutions proposed to the ENGINEER for approval. Partial or incomplete material lists will not be considered. No substitutions will be considered thereafter. Only one request for substitution will be considered on each item of material or equipment.

11. Request for Extension of Time

All extension of time requests shall be made in writing to the ENGINEER within seven (7) calendar days from the delay occurrence date. In the case of continuing cause of delay, only one claim is necessary.

12. Rights-of-Way

The CONTRACTOR shall not be entitled to extra compensation for hardships and increased cost caused by the WORK being adjacent to telephone-telegraph lines and guy wires, power lines and guy wires, buildings, fences, pipelines, ditches, roadways, and other obstacles which may physically restrict or limit the use of construction equipment. In some cases, such physical confinement may necessitate special methods of construction of the WORK. If the CONTRACTOR desires to utilize additional area, he shall obtain the necessary approvals from the landowner. No additional compensation shall be paid to the CONTRACTOR for the cost of obtaining additional right-of-way or for the inability to obtain such.

13. Coordination with Other Work

Other work including but not necessarily restricted to relocation of power and telephone poles, installation of a gas line and relocation of water meters may be in progress near or at the construction site at the time the CONTRACTOR is in performance of the WORK specified herein. The CONTRACTOR shall coordinate his WORK with that of others so that prosecution of all WORK will proceed smoothly.

14. Closure of Streets

The CONTRACTOR will be allowed to temporarily close the streets being paved to vehicular traffic between the hours 7:00 a.m. and 5:00 p.m. on the day the streets are being paved. All street closure dates shall be coordinated with and approved by the ENGINEER for approval no later than 10 working days prior to the earliest proposed closures and detours.

15. Construction Signs, Barricades, Lights and Flagmen

The CONTRACTOR shall furnish, erect and maintain adequate barricades, lights, signs and other devices and take other protective measures to prevent damage to the public. The CONTRACTOR shall also furnish adequate warning to the public of dangerous conditions to be encountered.

16. Traffic Control Plan

It is the CONTRACTOR'S sole responsibility to establish and implement a Traffic Control Plan conforming to Sections 7-1.08, "Public Convenience" 7-1.09, "Public Safety", and Section 12, "Construction Area Traffic Control Devices", of the Caltrans Standard Specifications. Nothing in these CONTRACT DOCUMENTS shall be construed as relieving the CONTRACTOR from his responsibility.

17. Disposal of Waste Materials

Waste material shall be disposed of in accordance with local regulatory requirements. Provide watertight conveyance for liquid, semi-liquid or saturated solids which tend to bleed during transport. Liquid loss from transported materials is not permitted, whether being delivered to construction site or hauled away for disposal. Fluid materials hauled for disposal must be specifically acceptable at selected disposal site.

18. Noise Control

Conduct operations to cause least annoyance to residents in vicinity of WORK, and comply with applicable local ordinances. Equip compressors, hoists, and other apparatus with mechanical devices necessary to minimize noise and dust. Equip compressors with silencers on intake lines. Equip gasoline or oil-operated equipment with silencers or mufflers on intake and exhaust lines.

19. Water Supply

Water will be available to the CONTRACTOR in performance of the Work without charge from all Owner fire hydrants. Prior to the use of any hydrant the CONTRACTOR shall notify the Owner and obtain and install a meter furnished by the Public Works Department on the fire hydrant. It will be the CONTRACTOR's responsibility to convey the water to the Work site. Regardless of the method of conveyance chosen, it shall not be cause for closure of any streets nor shall it create a nuisance to nearby residents. An air gap shall be maintained between the hose or pipe discharge to prevent possible backflow in the event of distribution system pressure loss. The CONTRACTOR shall pay a One Thousand Dollar ($1,000) deposit per meter for the use of the fire hydrant meter. The deposit may be refunded in full if the fire hydrant meter is returned undamaged.

20. Notifications

The Owner will notify the CONTRACTOR in writing of any non-compliance with the foregoing provisions or of any environmentally objectionable acts and corrective action to be taken. State or local agencies responsible for verification of certain aspects of the environmental protection requirements shall notify the CONTRACTOR in writing, through the Owner, of any non-compliance with State or local requirements. The CONTRACTOR shall, after receipt of such notice from the Owner or from the regulatory agency through the Owner, immediately take corrective action. Such notice, when delivered to the CONTRACTOR or his authorized representative at the site of the Work, shall be deemed sufficient for the purpose. If the CONTRACTOR fails or refuses to comply promptly, the Owner may issue an order stopping all or part of the Work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the CONTRACTOR unless it is later determined that the CONTRACTOR was in compliance.

21. Work Not Listed in Proposal

It is the intent of the plans, specifications and contract documents to provide for the construction of completed and finished facilities and works of improvement unless otherwise specifically provided. Except for authorized changes in the work, payment for said complete and finished facilities and works of improvement will be made only on the basis of the contract items of work listed in the proposal. All other work, including the furnishing of plants, labor, materials, tools, equipment, and incidentals, provided for in the plans, specifications and contract documents, or required for the proper completion of the work as a whole, for which no separate payment has been provided shall be a supplementary obligation of the CONTRACTOR and payment therefore shall be considered included in the prices paid for the various contract items of work listed in the proposal.

22. Submittals

The CONTRACTOR shall submit to the ENGINEER, a minimum of six sets of the following submittals for review and approval:

1. Sewer Pipeline and Appurtenances (Pipe, Fittings, Bends, Couplings, Saddles, Valves, Warning Tape, etc.)
2. Precast Concrete Structures Concrete Linings
3. Vault Lids and Access Hatches
4. Electrical Controls and Appurtenances
5. Submersible Pumps, Fittings and Appurtenances
6. Aggregate Base
7. Concrete Mix Design
8. Asphalt Concrete Mix Design
9. Pumping Bypass Plan

Within 10 days after the Effective Date of the Agreement and before starting to perform any WORK, the CONTRACTOR shall submit to the ENGINEER for review and approval:

1. A Work Schedule indicating the times for starting and completing the various stages of the Work. No PROGRESS PAYMENT shall be made to CONTRACTOR until an acceptable schedule has been submitted to the ENGINEER.
2. Traffic Control Plan
3. Notice to Residents in English and Spanish

4. A Schedule of Values - a breakdown of each lump sum price to be used to determine deductive change orders, if necessary.
5. A complete list of equipment and materials to be furnished
6. City of Los Banos Business License for Contractor and all Subcontractors

If more than TWO submittals for a single item are required because of incorrect or insufficient data, or the submittal is unacceptable, or because the CONTRACTOR wishes to change previously approved material, then all costs incurred by the OWNER for the additional review shall be deducted from monies due the CONTRACTOR.

A revised work schedule shall be submitted within 5 days of request by the ENGINEER. No future PROGRESS PAYMENT shall be made to CONTRACTOR until an acceptable schedule has been submitted to ENGINEER.

23. Bid Item Descriptions

The Contract payment for the specified items of work as set forth in the Bid Schedule shall be full compensation for furnishing all labor, materials, methods or processes, implements, tools, equipment and incidentals and for doing all work involved as required by the provisions of the Contract Documents for a complete in place and operational system.

A. Unless otherwise specified in the Specifications, quantities of work shall be determined per each, or from measurements or dimensions in a horizontal plane. All materials shall be measured on the basis of "in place" quantities and paid for using the units listed in the bid schedule.

B. Except as noted, the Engineer will make field measurements of unit price items in order to determine the quantities of the various items as a basis for payment. On all unit price items, the contractor will be paid for the actual amount of the work performed in accordance with the contract documents, as computed from field measurements.

C. Work or quantities not listed in the description of bid items are considered incidental to other construction and will not be separately measured or paid for. Compensation for such work and/or material shall be included in the prices paid for other items of work.

Bid Item No. 1 - Mobilization/Demobilization:

Payment for this item shall include full compensation for all labor, materials, tools, equipment and incidentals making up the cost of mobilization, move-in, move-out, all necessary bonds, insurance, permits, licenses, and fees required during the performance of the work as specified. This item also includes demobilization, including the removal of all equipment, supplies, personnel and incidentals from the project at the end of construction. Payment for mobilization shall be made with the first progress payment and shall not exceed 80 percent of the bid item amount. Payment for demobilization shall be made with the last progress payment and shall not be less than 20 percent of the bid item amount. This bid item will be paid for by Lump Sum.

Bid Item No. 2 - Sanitary Sewer Lift Station (F&I):

This bid item includes: furnishing and installing sanitary sewer lift station pumps and appurtenances including associated controls; anchorages, concrete structures, valve vaults, piping connections, testing, excavation, bedding, placement, trench backfilling, compaction and start-up services and shall be full compensation for furnishing all labor; equipment and materials to complete the installation as per the Plans and Specifications. This bid item will be paid for by Lump Sum, prorated, based on percentage of contract work completed.

Bid Item No. 3 - 6-inch DIP Bends and Fittings (F&I):

Payment under this item shall be considered full compensation for all labor, materials, tools, equipment and incidentals required to furnish and install 6” Ductile Iron bends and fittings to the lines and grades shown. Payment for this item shall be made on a Lump Sum basis, and shall include payment for all excavation, trench preparation, backfill, compaction, supports and other work required to result in a complete project. This bid item will be paid for by Lump Sum, prorated, based on percentage of contract work completed.

Bid Item No. 4 - 6-inch DIP Valves (F&I):

Payment under this item shall be considered full compensation for all labor, materials, tools, equipment and incidentals required to furnish and install 6” Ductile Iron Valves to the lines and grades shown. Payment for this item shall be made on a Lump Sum basis, and shall include payment for all excavation, trench preparation, backfill, compaction, supports and other work required to result in a complete project. This bid item will be paid for by Lump Sum, prorated, based on percentage of contract work completed.

Bid Item No. 5 - 6-inch DIP (F&I):

Payment under this item shall be considered full compensation for all labor, materials, tools, equipment and incidentals required to furnish and install 6” Ductile Iron Pipe to the lines and grades shown. Payment for this item shall be made on a Lineal Foot basis, and shall include payment for all excavation, trench preparation, backfill, compaction, supports, excavation; bedding, placement; trench backfilling, compaction and other work required to result in a complete project. This bid item will be paid for per Lineal Foot.

Bid Item No. 6 - Reconstruct Existing Lift Station Bottom:

Payment under this item shall be considered full compensation for all labor, materials, tools, equipment and incidentals required to reconstruct the existing lift station bottom, as shown and specified plus all other work necessary to result in a complete and operating manhole in accordance with the Plans and Specifications. This bid item will be paid for by Lump Sum, prorated, based on percentage of work completed.

Bid Item No. 7 - Electrical (Controls, Wiring & Appurtenances) F&I:

Payment under this item shall be considered full compensation for all labor, materials, tools, equipment and incidentals required to construct electrical controls, wiring and appurtenances as specified and all other work necessary to complete the installations in accordance with the Plans and Specifications. This bid item will be paid for by Lump Sum, prorated, based on percentage of work completed.

Bid Item No. 8 - Electrical Fees:

Payment under this item shall be considered full compensation for all labor, and incidentals required to pay for all PG&E electrical connection/application fees and inspections necessary to complete the installations in accordance with the Plans and Specifications. This bid item will be paid for by Lump Sum, prorated, based on percentage of work completed.

Bid Item No. 9 - Demolition (Removal: (E) Pumps, (E) Controls and Piping):

Payment under this item shall be considered full compensation for all tools, equipment and incidentals required to remove pumps, controls and piping as indicated on the drawings and specified. This bid item will be paid for by Lump Sum, prorated, based on percentage of work completed.

Bid Item No. 10 - Wet Well Coating:

Payment under this item shall be considered full compensation for all labor, materials, tools, equipment, special inspections and incidentals required to apply a protective Wet Well Coating as indicated on the drawings. Bid quantity shown is estimated from approximate dimensions. This bid item will be paid for per Vertical Foot.

Bid Item No. 11 - Bypass Pumping:

Payment under this item shall be considered full compensation for all labor, materials, tools, equipment and incidentals required to perform bypass pumping operations as specified. This bid item will be paid for by Lump Sum, prorated, based on percentage of work completed.

Bid Item No. 12 - Remove Concrete (Sidewalk & Driveway):

Payment under this item shall be considered full compensation for all labor, materials, tools, equipment and incidentals required to remove concrete sidewalk and driveway to the lines and grades shown and specified. This bid item includes sawcutting, concrete removal, excavation, and all other work required to result in fully removed sidewalk and driveway as indicated on the drawings. Bid quantity shown is estimated from approximate dimensions. This bid item will be paid for per Square Foot.

Bid Item No. 13 - Remove Curb and Gutter:

Payment under this item shall be considered full compensation for all labor, materials, tools, equipment and incidentals required to remove concrete curbs and gutters to the lines and grades shown and specified. This bid item includes concrete removal, excavation, and all other work required to result in fully removed curb and gutter as indicated on the drawings. Bid quantity shown is estimated from approximate dimensions. This bid item will be paid for per Lineal Foot.

Bid Item No. 14 - Remove Asphalt Pavement:

Payment under this item shall be considered full compensation for all labor, materials, tools, equipment and incidentals required to remove asphalt pavement to the lines and grades shown and specified. This bid item includes sawcutting, pavement removal, excavation, and all other work required to result in fully removed asphalt pavement as indicated on the drawings. Bid quantity shown is estimated from approximate dimensions. This bid item will be paid for per Square Foot.

Bid Item No. 15 - Minor Concrete (Sidewalk):

Payment under this item shall be considered full compensation for all labor, materials, tools, equipment and incidentals required to construct concrete sidewalk to the lines and grades shown and specified. This bid item includes preparation and compaction of subgrade, furnishing, grading and compacting the granular base material, forming, furnishing the Portland cement concrete, placement, finishing and all other work required to result in a complete sidewalk. Bid quantity shown is estimated from approximate dimensions. This bid item will be paid for per Square Foot.

Bid Item No. 16 - Minor Concrete (Curb and Gutter):

Payment under this item shall be considered full compensation for all labor, materials, tools, equipment and incidentals required to construct concrete curbs and gutters to the lines and grades shown and specified. This bid item includes preparation and compaction of subgrade, furnishing, grading and compacting the granular base material, forming, furnishing the Portland cement concrete, placement, finishing and all other work required to result in a complete curb and gutter. Bid quantity shown is estimated from approximate dimensions. This bid item will be paid for per Lineal Foot.

Bid Item No. 17 - Asphalt Replacement:

Payment under this item shall be considered full compensation for all labor, materials, tools, equipment and incidentals required to furnish and place asphalt concrete pavement to the lines and grades shown and specified. This bid item will include any necessary surface preparation such as compaction and grading of the existing base or native material, furnishing, spreading and compacting the aggregate base, furnishing, placing and compacting asphalt concrete pavement material, prime coat, asphaltic emulsion coating on vertical surfaces to abut the new pavement, and all other work required to result in an asphalt pavement meeting the requirements of the Specifications. This bid item will be measured by the Square Foot of material placed within the limits shown on the Drawings. This bid item will be paid for per Square Foot.

City of Los Banos
At the Crossroads of California

CITY OF LOS BANOS
PUBLIC WORKS DEPARTMENT

TECHNICAL SPECIFICATIONS FOR:
JO-LIN SEWER LIFT STATION REHABILITATION PROJECT

REGISTERED PROFESSIONAL ENGINEER
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STATE OF CALIFORNIA

01/28/2016

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TABLE OF CONTENTS

TECHNICAL SPECIFICATIONS

DIVISION 40 – PROCESS INTEGRATION

DIVISION 43 – PROCESS GAS AND LIQUID HANDLING, PURIFICATION AND STORAGE

SECTION 01 70 00

CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 GENERAL

A. It is the intent of these Contract Documents that the Contractor shall deliver a complete and operable facility capable of performing its intended functions and ready for use.

1.2 CLEANING

A. Throughout the period of construction the Contractor shall keep the Work site free and clean of all rubbish and debris, and shall promptly remove from the site, or from property adjacent to the site of the Work, all unused and rejected materials, surplus earth, concrete, plaster, and debris, excepting select material which may be required for refilling or grading.

1.3 FINAL SITE CLEAN-UP

A. Upon completion of the Work, and prior to final acceptance, the Contractor shall remove from the vicinity of the Work all paint, surplus material, and equipment belonging to him or used under his direction during construction.

B. The Contractor shall restore to original condition all property not designated for alteration by these Contract Documents.

1.4 FINAL BUILDING CLEAN-UP

A. On all projects and wherever else applicable, besides general broom cleaning, the following special cleaning shall be performed at completion of the Work:

1. Hardware shall be cleaned of all traces of stains, dust, dirt, paints, and blemishes.

2. Equipment shall be cleaned and stains, paint, dirt, and dust shall be removed.

3. Dust, cobwebs, and traces of insects and dirt shall be removed.

1.5 WASTE DISPOSAL

A. The Contractor shall dispose of surplus materials, waste products, demolition materials, and debris. The Contractor shall transport and dispose of waste materials in accordance with applicable laws and regulations.

1.6 PROJECT RECORD DOCUMENTS

A. The Contractor shall maintain at the site, available to the Owner and Engineer, one copy of the Contract Documents, Drawings, Shop Drawings, Change Orders, and other modifications in good order and annotated to show all changes made during construction. These Documents shall be delivered to the Engineer for the Owner upon completion of the Work.

B. Record documents shall be reviewed during progress meetings to ascertain that all changes have been recorded.

C. Store Record Documents separate from documents used for construction.

1.7 TOUCH-UP AND REPAIR

A. The Contractor shall touch-up or repair finished surfaces on structures, equipment, fixtures, or installations that have been damaged prior to final acceptance. Surfaces on which such touch-up or repair cannot be successfully accomplished shall be completely refinished or in the case of hardware and similar small items, the item shall be replaced. Such items shall include, but not be limited to, the following:

1. Road surfaces
2. Sidewalk and Driveway surfaces
3. Exposed equipment surfaces
4. Exposed piping surfaces

1.8 EQUIPMENT START-UP

A. After all acceptance tests have been completed by the Contractor and Owner but prior to final acceptance, the Contractor shall recheck all equipment for proper alignment and adjustment, check oil levels, re-lubricate all bearings and wearing points, and in general assure that all equipment is in proper condition for continuous operation.

1.9 OPERATION AND MAINTENANCE (O&M) MANUALS

A. The contractor shall provide operations and maintenance manuals for all equipment to the City prior to final project acceptance.

1.10 FINAL EQUIPMENT CHECK

A. After testing and before acceptance, all equipment shall be test run by the Owner for a minimum of 7 days to ensure proper operation. At the end of the test run each piece of machinery shall be lubricated and all components and couplings checked for proper alignment and adjustment.

B. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's inspection.

C. Provide submittals to the Owner required by other governing authorities.

1.11 MANUFACTURER'S CERTIFICATES OF PROPER INSTALLATION

1. The Contractor shall submit manufacturers' certificates of proper installation for all items of equipment.

PART 2 PRODUCTS

(Not Used)

PART 3 EXECUTION

(Not Used)

END OF SECTION

SECTION 02 01 20

PROTECTING EXISTING UNDERGROUND UTILITIES

PART 1 GENERAL

1.1 UNDERGROUND FACILITIES

A. Shown or Indicated*:* The information and data shown or indicated in the Contract Documents with respect to existing underground facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such underground facilities, including Owner, or by others.

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data; and

2. The cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

a. Reviewing and checking all such information and data,

b. Locating all Underground Facilities shown or indicated in the Contract Documents,

c. Coordination of the Work with the owners of such underground facilities, including Owner, during construction, and

d. The safety and protection of all such underground facilities and repairing any damage thereto resulting from the Work.

B. Not Shown or Indicated: If an underground facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated with reasonable accuracy in the Contract Documents, the General and Special Provisions shall apply.

1. Contractor shall develop and execute a work-plan, subject to Engineer's approval to protect underground facilities.

2. The Contractor shall expose, prior to staking and trenching, all existing utilities and existing facilities which may control proposed facility grades, and alignment. Two working days notice shall be given to the Engineer prior to commencing this work.

3. Full compensation for all costs involved in locating, verifying, protecting, exposing, and otherwise providing for utilities shall be included in the amounts bid for the various items of work, and no separate payment shall be made therefore.

1.2 PROTECTION

A. The Contractor shall not interrupt the service function or disturb the supporting base of any utility by disrupting any facility identified in the Plans and Specifications without authority from the Owner or order from the Engineer. Where protection of such facilities is required to ensure support of utilities, the Contractor shall, unless otherwise provided, furnish and place the necessary protection at the Contractor's expense.

B. The Contractor shall be prepared at all times with labor, equipment and materials to make repair on damaged mains or Utility facilities. The Contractor shall immediately notify the Engineer and the Utility owner if he disturbs, disconnects or damages any Utility. The Contractor shall bear the costs of repair or replacement of any Utility facility described with reasonable accuracy in the Plans and Specifications that is damaged by the Contractor. No extra compensation will be made for the repair of any services or mains damaged by the Contractor, nor for any damage incurred if the neglect or failure of providing protective barriers, lights and other devices or means required to protect such existing utilities or facilities described with reasonable accuracy in the Plans and Specifications.

1.3 SURVEY MARKERS AND PERMANENT REFERENCE POINTS

A. Surveying and Permanent Survey Markers

The Engineer will take measurements to assure the preservation of survey markers (monuments and bench marks). The Contractor shall not disturb permanent survey markers without the consent of Engineer and shall bear the expense of replacing any that may be disturbed without permission.

1. Replacement of survey markers shall be done only by the Engineer.

2. If disturbing of markers cannot be avoided, the Owner shall pay the cost of replacing said markers.

B. Lot Corner Monuments

The Contractor shall preserve property line and corner survey markers except where their destruction is unavoidable and the Contractor is proceeding in accordance with accepted practice. Markers that are lost or disturbed by his operations shall be replaced at the Contractor's expense by the Engineer. A corner record shall be filed in accordance with State law for any reset monuments at the Contractor’s sole expense.

END OF SECTION

SECTION 02 41 00

DEMOLITION

PART 1 GENERAL

1.1 DESCRIPTION

A. The work of this section consists of demolition and removal of pavements, slabs, miscellaneous debris, pumps, control boxes, barriers, salvaged items, and portions of abandoned utilities.

1.2 WORK INCLUDED

A. Repair and restoration of areas damaged due to demolition work.

B. Salvaging of equipment for Owner.

C. Removal of demolished materials from site.

D. Remove existing piping and other existing structures as shown on the Plans to be removed.

E. Properly dispose of all removed materials which are not salvaged for Owner.

1.3 RELATED WORK

A. Section 03 33 15 – Concrete Sidewalk, Curbs & Gutter

B. Section 03 41 00 – Precast Concrete Structures

C. Section 31 23 16 – Trenching, Backfilling and Compaction

D. Section 32 12 16 – Asphalt Concrete Paving

1.4 SEQUENCING

A. Sequence work to minimize interference with sewer lift station operations.

1.5 REGULATORY REQUIREMENTS

A. Obtain required permits from City of Los Banos.

1. Business License

B. Dispose of removed materials in an approved disposal or salvage facility.

C. Contractor and all subcontractors shall obtain City of Los Banos business license.

1.6 REFERENCES

A. Section 19 – Earthwork, State Standard Specifications

B. Section 39 – Asphalt Concrete, State Standard Specifications

C. Section 90 – Portland Cement, State Standard Specifications

1.7 SUBMITTALS

A. Submittals shall be in accordance with the Standard General and Special Provisions.

B. Demolition plan including sequence of operations. The plan shall specifically address methods of demolition, schedule, sequence of demolition, and procedures for archeological monitoring. Demolition shall not proceed until the plan has been approved.

1.8 QUALITY ASSURANCE

A. General: Take all necessary precautions with regard to safety in carrying out the demolition and site work. Erect suitable barriers around open excavations and fulfill all appropriate requirements of CAL/OSHA. Comply with safety requirements for demolition, ANSI A10.6-90.

1.9 PROJECT CONDITIONS

A. Underground utilities exist at this site. Contractor shall take all necessary precautions to protect said utilities. Notify Engineer of any deviation in utility location from that which is shown on the drawings.

B. Keep dust to a minimum at project site. Use sprinklers or water trucks as necessary or as directed by the Engineer.

C. Ensure safety of persons in demolition area. Provide temporary barricades as required.

D. Excavations may encounter groundwater and require dewatering depending on the time of year and amount of seasonal run-off. Loose sands exposed in excavation sidewalls may be unstable and require shoring or lying back in accordance with OSHA requirements. Flowing sands may also be encountered in excavations below groundwater levels.

1.10 CLOSEOUT SUBMITTALS

A. As specified in Section 01 70 00 – Project Closeout.

B. Show all capped and abandoned utility terminations and location of remaining facilities on project Record Drawings.

PART 2 PRODUCTS

2.1 REPAIR AND RESTORATION MATERIALS

A. Asphalt and concrete shall match existing materials and conditions.

B. Asphalt and concrete shall be replaced in conformance with project specifications and City of Los Banos Standards.

2.2 MATERIALS

A. Salvaged Materials: Materials to be salvaged shall remain the property of the Owner and shall be stockpiled as directed by the Engineer. Contractor shall inventory all salvaged materials. Stockpiled materials shall be free of hazardous substances. Salvaged materials include but are not limited to:

1. Manhole Lids.

2. Motors, Pumps and Electrical Control Boxes.

3. Valves

B. Items to be Salvaged and Relocated shall be salvaged and/or relocated as shown on the Drawings, or as directed by the Engineer.

C. Materials and items demolished and not designated for reuse, salvage or transfer to the Owner, as well as all debris, rubbish and other materials resulting from the demolition operations, shall become the property of the Contractor and shall be removed from the site within 48 hours of demolition.

D. Storage or sale of the removed items will not be permitted at the site.

PART 3 EXECUTION

3.1 INSPECTION

A. Prior to demolition, inspect the site conditions, verifying all governing dimensions, notes and specification. Notify the Engineer of any errors or omissions in the contract documents.

B. Make such explorations and probes as are necessary to ascertain any required protection measures before proceeding with the demolition and removal work.

3.2 PREPARATION

A. Protect existing, appurtenances, structures, which are not to be demolished.

3.3 DEMOLITION REQUIREMENTS

A. Conduct demolition to protect and minimize damage to structures and existing improvements.

B. Conduct salvaging to protect and minimize damage to salvaged equipment.

C. All work within City right of way shall conform to Section 15 of the State Standard Specifications.

D. Execute the work in a careful, orderly and safe manner, with the least possible disturbance to the public. Cease operations immediately if adjacent work appears to be endangered. Do not resume operations until corrective measures have been taken.

E. Pavement and Slabs:

1. Remove completely all Portland cement concrete slabs-on-grade including, but not limited to, equipment pads, sidewalks, etc.

2. Saw cut existing asphalt concrete pavements cleanly in straight continuous lines. Remove asphalt concrete pavement as shown on the Drawings

F. Items to be Salvaged: Remove as directed by the Engineer. Remove carefully. All salvaged material remains the property of the Owner. Store where directed by the Engineer.

3.4 SALVAGED EQUIPMENT

A. Salvaged equipment shall be delivered to the Owner at a designated site within the project site. Salvaged equipment shall be placed on wood or concrete blocks so the equipment will be 4 inches minimum above ground elevation.

B. Equipment to be salvaged at the lift station:

1. All pumps, including motors.

2. Blower and motor assembly, including control panel.

3. All electrical panels, including breakers, contactors, disconnects, fuses, relays and switches.

C. Electrical equipment items to be salvaged are covered in the electrical plans and specifications.

3.5 ORDER OF WORK

A. Contractor to install operate and maintain bypass pumping to ensure that the existing force main and gravity sewer remain in operation until the rehabilitated lift station system is in operation. Contractor shall submit temporary bypass pumping plans to Owner for approval least 10 days prior to bypass pumping. Contractor shall not begin work until the bypass plan is approved by the City. Bypass pumping will remain in effect until the lift station has been deemed operational by the City.

3.6 PRESERVATION

A. If indicated or required, preserve trees, plants, rock outcroppings, or other features designated to remain. Protect trees and plants from damage; fell trees in a manner which shall not injure standing trees, plants and improvements which are to be preserved.

3.7 RESTORATION

A. All demolition areas, staging/stockpiling, and open excavations shall be filled in accordance with the Earthwork Sections. Fill all open excavations to an elevation matching the surrounding topography.

   1. New Construction Areas: As shown on drawings.

3.8 DISPOSAL

A. As specified in the General and Special Provisions.

END OF SECTION

SECTION 03 33 15

CONCRETE SIDEWALK, CURB, AND GUTTER

PART 1 GENERAL

1.1 WORK INCLUDED

A. The work of this section consists of constructing concrete walks, curbs, and gutters.

1.2 RELATED WORK

A. Section 03 41 00 - Precast Concrete Structures

B. Section 31 23 16 – Trenching, Backfilling and Compacting

1.3 REFERENCES

A. Section 90- Portland Cement Concrete, State Standard Specifications.

1.4 SUBMITTALS

A. Submittals shall be in accordance with the General and Special Provisions.

1.5 PROJECT CONDITIONS:

A. Place concrete only when temperatures are above 35 degrees F, unless it is protected from freezing.

PART 2 PRODUCTS

2.1 SELECT FILL

A. Dense, readily compactable material, free from vegetable matter and lumps of clay. Excavated material that meets this requirement may be used if approved.

2.2 BASE COURSE

A. Hard, durable particles of stone, gravel, or other finely divided mineral matter. All particles shall pass a 1-inch square mesh sieve and shall be uniformly graded from coarse to fine to produce a dense, compacted base.

2.3 CONCRETE

A. Materials: Materials, including cement, aggregates, water, and admixtures, shall meet the requirements of ASTM C94-90.

1. Cement: Type II.

2. Coarse Aggregate: Maximum size, 1-inch for hand methods, 3/4-inch for slip-form construction, and 1/2-inch for extruded curbs. For machine placed concrete, Contractor may, with Contracting Officer's approval, modify the aggregate grading specified in ASTM C94-90 to meet the recommendations of the manufacturer of the machine.

B. Minimum Cement Content: 6 sacks per cubic yard.

C. Slump:

1. Concrete Walks: Maximum 4 inches.

2. Curb and Gutter:

a. Hand Vibrated: Maximum 3 inches.

b. Slip-Formed: Maximum 2 inches.

3. Extruded Curbs: Maximum 1 inch.

D. Strength: 3,000 psi at 28 days.

E. Manufacture and Delivery: Measurement of materials, batching, mixing, transporting, and delivery shall be as specified in ASTM C94. Discharge concrete into forms within 1-1/2 hours after introduction of water to cement. When temperature of concrete is 85 degrees F or above, the time between introduction of water to cement and complete discharge of concrete into forms shall not exceed 45 minutes.

F. Air Entraining Admixture: ASTM C260.

G. Other admixtures complying with ASTM C494 or ASTM C618 may be used with approval of Engineer. No chlorides will be permitted.

PART 3 EXECUTION

3.1 PREPARATION OF SUBGRADE

A. Excavate to required depth. Remove soft, yielding material and replace with select fill. Compact to a density of not less than 95 percent of the maximum density.

3.2 MAINTENANCE OF SUBGRADE

A. Maintain subgrade in a compacted condition until concrete is placed.

3.3 FORMS

A. Metal or uniform warp-free lumber, coated with form release agent. Grade forms to give slabs positive drainage and stake securely. Obtain approval of alignment and grade before placing concrete.

3.4 PLACING:

A. Concrete slabs for walks shall be formed, placed, vibrated, and finished by hand using conventional methods. Concrete curbs or curbs and gutters may be constructed in the same manner, but Contractor has the option of machine placing curbs using the extrusion method or machine placing curb and gutter using the slip-form method.

B. Place concrete on moistened subgrade monolithically between construction joints. Deposit to full depth in one operation. Consolidate immediately. After depositing concrete, screed and darby or bullfloat.

3.5 FORM REMOVAL

A. Remove forms within 24 hours after concrete placement. Repair minor defects with mortar. Plastering will not be permitted on exposed faces.

3.6 SLAB FINISHING

A. After darbying or bullfloating, stop finishing until bleeding has ceased and until concrete can support foot pressure with only about 1/4-inch indentation. Edge and joint, then float the slab. Use steel trowel to densify surface, then broom slab perpendicular to line of traffic.

3.7 JOINTS

A. Construct joints true to line with faces perpendicular to surface.

1. Contraction (Control) Joints: Space walk joints at intervals about equal to width of walk to a depth of one-fourth the slab thickness. Space curb and gutter joints not over 12 feet 6 inches on center, and align them with sidewalk joints. Contraction joints shall be tooled.

3.8 SIDEWALK RESTORATION

A. Where sections of miscellaneous sidewalk work requires removal and restoration the following shall apply:

1. The surface of the sidewalk shall match the existing weakened plane joints, score joints and construction joint patterns with the adjoining sidewalks or City standards.

2. Where short sections of sidewalk have been removed for replacement, a minimum distance to the nearest groove joint shall be removed or as directed by the Engineer.

3. If curbs and gutters cannot be cut off square and neat, the entire curb and gutter shall be removed to the nearest weakened plane or expansion joint. No patching at joints will be permitted.

3.9 FIELD QUALITY CONTROL

A. Surfaces shall not vary more than 5/16 inch when tested with a 10-foot straightedge, nor curb gutters and valley gutters shall not vary more than 0.03-foot from design grade.

END OF SECTION

SECTION 03 36 00

CONCRETE LINING FOR CORROSION PROTECTION

PART 1 GENERAL

1.1 WORK INCLUDED

A. This specification includes furnishing at the contractor's price, all permits, insurance, labor, materials, supervision, equipment, tools, and associated quality control tests necessary to perform the required cleaning, surface preparation, linings application, and clean up to designated areas identified in this specification, on drawings, or "job walks" provided at the jobsite for new linings on the interior of concrete structures as shown on the plans and as identified by the City.

1.2 QUALITY ASSURANCE

A. Any conflicts or inconsistencies found to exist in this specification should immediately be brought to the City's attention in writing. The Contractor shall provide a City approved third-party lining inspector qualified N.A.C.E. III to provide inspection services for the lining application.

B. The Supplier's latest published instructions for the proper use and application of the lining materials are a part of this specification.

C. All welding, burning, cutting, grinding, and other such repairs shall be complete prior to commencing abrasive blasting and/or application of the lining material.

D. This specification requires Contractor compliance with all environmental safety and worker safety regulations affecting the scope of this work.

E. The contractor shall demonstrate, by reference or other suitable means, the capability to provide the craftsmanship, experience, and equipment necessary to perform satisfactorily to this specification. This shall include detailed procedures describing how the following will be accomplished: Surface preparation, lighting, ventilation, material storage, heating, material mixing, and application of the lining materials to the City's satisfaction. The contractor shall be a licensed lining contractor and shall be approved by the manufacturer of the proposed lining system. The contractor shall have a minimum of five years experience applying the approved lining system and shall show by reference 5 projects of similar size and scope with contact names and phone numbers at the request of the engineer. The contractor shall possess a C-33 license. The contractor shall be licensed and certified as an approved applicator by the proposed lining material manufacturer and shall provide this certification with their bid. The contractor shall be licensed to apply the polyurethane system proposed using the gas injection method known as ECOSYSTEM® and shall provide this documentation with their bid.

F. The proposed material manufacturer shall have been in the regular business of manufacturing the approved lining system for a minimum of 15 years. They shall show by reference a minimum of five projects that are 15 years old and in service today including contact names and phone numbers at the request of the engineer.

G. This specification requires that the environmental conditions shall be controlled from start to finish of this job to help assure quality work is completed in a timely manner or specified time as may be stated elsewhere in this specification.

H. All materials and equipment brought to the jobsite to perform work shall be promptly removed from City's property at the completion of work except the installed lining, unless otherwise specifically agreed to with the City.

I. Used grit generated during abrasive blasting may be classified as hazardous waste. Laboratory testing, classification, and determination of disposal methods are mandatory. Documentation of the above items shall be submitted and approved by City before removal from the jobsite.

J. Abrasive blasting operations, cleaning operations, and lining material applications are not permitted in the same area at the same time or before lining materials have dried.

K. All surfaces subject to damage by blasting, cleaning and lining operation, such as, exterior coated surfaces, machined surfaces, valve stems, nameplates, pump shafts, meters, sight glasses, machinery bearings, and other such items shall be protected. All protective wraps or tape shall be removed upon completion. All damaged external areas shall be repaired to the original condition.

L. All work shall be scheduled and performed in cooperation with the City to maintain effective operations within "NORMAL WORKING HOURS."

M. All workmanship shall be of journeyman quality, performed by skilled and competent craftsmen. The City reserves the right to have the Contractor remove any workman who, in the opinion of the City's representative, refuses to perform or is incapable of performing satisfactory and acceptable work, or who violates any safety rules or practices of the City, County, and/or State ordinances and laws.

1.3 REFERENCED STANDARDS

A. Referenced standards shall be the latest revision unless otherwise specified.

B. Steel Structures Painting Council, National Association of Corrosion Engineers, and American Society for Testing and Materials Standards as follows:

DESIGNATION	**DESCRIPTION**
SSPC-SP1	Solvent Cleaning
SSPC-SP2	Hand Cleaning
SSPC-SP3	Power Tool Cleaning
SSPC-SP5	White Metal Blast Cleaning
SSPC-SP6	Commercial Blast Cleaning
SSPC-SP10	Near White Blast Cleaning
SSPC-SP 12	Low Pressure Water Jet
SSPC-SP13	(1999) Surface Preparation of Concrete NACE No. 6

SSPC-VIS1	Pictorial Surface Preparation Standards
NACE-Std.-RPO178-78	Design, Fabrication & Surface Finish Metal Tanks & Vessels Lined for Chemical Immersion Service
NACE-Std.-RPO188-88	Discontinuity (Holiday) Testing of Protective Coatings
NACE-Std.-RPO288-88	Inspection of Linings on Steel and Concrete
ASTM D 4263-83	Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
ANSI/ASTM D4541	Test Method for Pull-Off Strength of Coatings Using Portable Adhesion-Testers

C. Technical Definitions:

1. 100 Percent Solids: Coatings containing zero volume solvent: zero VOC

2. VOC: Volatile Organic Compound

3. Plural Component: An application unit that will pump, heat, proportion, mix, and deliver the two (or more) component materials utilizing airless or conventional spray guns, or pour nozzles. The individual components are supplied to the heaters and proportioning pump through separate feed pumps, with the materials being pressurized and metered by the proportioning pump and then transferred to the mixer/manifold through individually heat-traced material lines. At the mixer/manifold, materials meet and are intimately blended before deposition onto the substrate by airless or conventional spray, or pour nozzles, as a non-stressed, seamless monolithic lining system.

4. Single Coat: A deposition of the material to the required thickness through multiple passes comprising of a single application in which no period greater than one hour is required to allow the material to "set" before continuing to build to specified thickness.

5. Recoat Window: The period of time that has passed when it is acceptable to apply succeeding coats without additional surface preparation.

6. Durometer: An inspection tool used to determine the hardness (indicative of level of cure) in an applied polyurethane film.

PART 2 PRODUCTS

2.1 LINING SYSTEM:

A. The applied lining material shall be a two-component (2:1 mix by volume) chemically reactive product specially formulated 100 percent solids, aromatic, MDI, pure elastomeric polyurethane lining system, ASTM type V, and shall be applied using a heated "plural component" proportioning equipment system designed for high pressure airless spray (maximum 2500 psi) for a minimum distance from the proportioner to meet job conditions. 1:1, 3:1 or any proportion other than 2:1 ratio polyurethane formulations shall not be considered as equal to the 2:1 ratio material. The lining material shall contain no extenders or fillers, shall not be a hybrid and shall exhibit the following physical properties and test values.

Tensile strength per ASTM D638 .... 2800-3000 psi
Elongation per ASTM D638 .... 40%-65%
Abrasion resistance per ASTM D4060 ....< 54 mg loss
Impact resistance per ASTM G-14 ....210 inch pounds
Water Vapor permeability per ASTM D1653-91A 048grms/24 hours/ft2
Atlas Cell test NACE TM-04-74 Test Procedure A................. 12 months No Effect

B. Maximum recoat window of 24 hours.

C. The liner material shall be Endura Flex EF1988®. No substitutes allowed.

D. The Contractor shall name the Supplier and provide written certification from the manufacturer of the proposed materials, compliance with current Contractor approvals and licenses to apply the material at the time of bid submittal.

E. All materials shall be received at the jobsite in their original unopened containers with labels intact. Batch numbers for all components of the lining system shall be recorded and copies made available for the City.

F. All materials shall be stored where they are protected from the weather and dampness. Storage temperatures shall be those recommended by the manufacturer.

2.2 EQUIPMENT REQUIREMENTS

A. Contractor shall utilize Plural Component proportioning equipment capable of pumping two separate streams of polyurethane components at the required ratio volumetrically.

B. Contractor shall have capability to heat the two different liquid components to a process temperature range from 100^0 to 110^o Fahrenheit (38^0 to 42^o C). The use of band heaters is NOT acceptable.

C. Contractor shall have capability to maintain process temperature to spray through a gun or pour through the nozzle. The use of insulated heat-trace fluid lines is mandatory.

D. Contractor shall have capability to pump at pressures ranging from 1200 PSI to 3000 PSI.

E. Contractor shall have capability to bring the two separately proportioned streams together as one stream and mix them together to provide a homogeneous mixture for reacting into a solid polymer of known properties.

F. Contractor shall provide spray atomization tip sizes matched to the pumping equipment output which provides a fully atomized spray pattern, free of "fingers" without the addition of solvents of any kind.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

A. Concrete General: Voids, bug holes, tie holes, or cracks in the concrete should be filled/sealed using the following methods:

1. Cracks that exceed 1/16” shall be filled with industry recognized epoxy injection procedures.

2. Surface voids shall be filled per approved lining manufacturer’s recommendations.

3. Form fins and sharp offsets, protrusions, or similar irregularities projecting from the concrete surface shall be removed by chipping, bush hammering, needle gunning, wire brushing, or other mechanical means.

4. Water seepage into or through the concrete shall be stopped and concrete thoroughly dried by suitable means before the system is applied.

B. Expansion Joints and Terminations:

1. Expansion Joints: Expansion joints shall be sealed with a bond breaker tape (polyethylene-backed adhesive tape such as used for wrapping pipe joints is acceptable). Before installation of the bond breaker tape, remove sharp protrusions, verify the surface is clean and dry, and inspect to assure that joint filling material is reasonably flush with top of expansion joint. The tape shall be installed centered over the joint and be of sufficient width to extend a minimum of one inch onto the concrete on both sides of the joint. Tape thickness should be no more than 60 mils maximum. The bond breaker tape shall be top coated with EF-1988 to the minimum specified thickness plus an extra 20 mils for added strength since there is no bond to the substrate in these areas.

2. Leading Edges/Terminations: All surfaces specified for lining application that do not include a well defined beginning or ending shall be mechanically anchored to a dry, clean saw cut to a minimum depth of 1/4 inch and width of 1/8 inch. The EF-1988 solid base coat shall be applied into the saw cut to full depth. After installation of the leading edge, the area shall be top coated with EF-1988 material. Adjacent areas not scheduled for lining shall be taped off and protected from overspray.

C. Abrasive Blast Cleaning:

1. Concrete Surface Cleanliness: Sprinkle water on the dried suspect concrete surface. If the water spreads out immediately instead of standing as droplets, it may be concluded that the surface is not contaminated by oils or dust. If droplets are found, use the procedure stated in Paragraph 3.1 C.2 or C.3, as appropriate.

2. Chemical Cleaning: The site shall be maintained free of debris, water, oil, grease, silicones, wax, pitch, and other types of oily substances. Surfaces showing evidence of such contaminants shall be cleaned using solutions of caustic soda or trisodium phosphate. They should be applied with vigorous scrubbing, followed by flushing with fresh water to remove all traces of both the detergent and contaminant and shall then be thoroughly dried.

3. Abrasive Blast Cleaning: Oil and grease that have soaked into the surface should be removed prior to blast cleaning. Abrasive blast cleaning shall be utilized in accordance with SSPC SP13 to obtain a surface in which a textured finish is achieved. If the surface of the concrete is weak, more material should be removed. Sufficient material shall be removed to result in a strong, sound substrate. The compressed air used for blasting or blow downs shall be clean and free of oil particles. This means that the air compressor shall be equipped with efficiently-operating oil and water traps. Refer to NACE procedure for "Blotter Testing" of compressed air.

4. Surface Cleanliness, Dusty Condition: Wipe the surface with a dark, clean cloth. If a white powder is on the cloth, the surface is considered to be too dusty and therefore unsatisfactory for lining. Blow down the areas with clean, dry air.

5. Surface Cleanliness, pH Condition: Use either pH paper or a pH Meter to determine the pH at the concrete surface. A pH range of seven-to-nine is considered acceptable.

D. Existing Bare Concrete; Dry, Deteriorated, with Exposed Aggregate:

1. Surfaces to be coated shall be abrasive blasted, hydro-blasted, or a combination of both in order to remove all loose, soft, and contaminated concrete back to sound and structurally stable material, as stated in Paragraph 1.04.C.

2. All surfaces to be coated shall be completely dry, clean, and contaminant-free before application. Surface dryness shall be verified according to ASTM D 4263 - Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.

E. Steel Surfaces:

1. All existing bare steel surfaces shall be abrasive blasted to a cleanliness level of SSPC-SP 10.

2. All existing bare steel surfaces shall exhibit an anchor profile of 3.5-4 mils as measured by testex tape.

3.2 APPLICATION

A. Before start of application and at such times when long breaks are involved or application equipment malfunctions, the following four material quality tests shall be performed for the Inspector.

1. A ratio check to verify required volumetric proportioning.

2. A mixed material check to verify proper mixing of components.

3. Curing cycle test to verify the proper reaction is under way. At least a pint sample is to be utilized. First Durometer results should be determined in 15 minutes.

4. A weight check (10 oz. container with solid material and a 10 oz. container with expanded material) to verify proper expansion rate.

B. All surfaces receiving the lining shall be visually dry and at least 50º Fahrenheit (3^{o} C.) above the Dew Point prior to starting the installation to prevent moisture entrapment. The Relative Humidity shall not exceed 85%. Successive topcoats, if necessary, shall be applied within 24 hours so as to not exceed t^{h}e recoat window.

C. The compressed air shall be clean and free of oil and water. Refer to NACE Blotter Test procedure.

D. Base component shall be mixed thoroughly with a power mixer. Base and Activator shall be heated to 100-110^{o} Fahrenheit (38-43^{o} C.) prior to use.

E. **Thinning of Material is Prohibited.**

F. The applied repair lining shall be a uniform system applied to a minimum thickness of 250 mils TDFT, of which 200 mils is expanded and 50 mils is solid, utilizing ECOSYSTEM® technology for the gas injection of polyurethane films.

G. The lining shall be installed as a liquid seamless system by spray or pour directly to the substrate, allowing the material to conform to the profile of the substrate, creating a non-stressed, seamless monolithic film.

H. Wet film thickness shall be monitored throughout the installation by means of frequent measurements with a high-range wet film thickness gage.

I. If the project is not completed, then at the end of the work day a three-to-twelve inch "returning edge" of material will be left tapered to the substrate for the start of the next workday. The "returning edge" shall be cleaned free of any visible contaminates before proceeding to spray on start up the following workday.

J. The spray application shall be according to the principles of good workmanship outlined in SSPC-PA1-82, and shall provide a finish which is continuous, uniform in thickness, and verified free of pores or other defects using electrical discontinuity testing (high voltage spark testing).

3.3 INSPECTION AND QUALITY CONTROL

A. The Contractor shall enlist the aid of various field tests and implement those tests to verify the integrity of the applied lining to his satisfaction. The City shall be permitted full access at all times to observe and be satisfied that the specification is being followed.

B. The City shall be given sufficient notice so as to be present, if desired, when the following hold points are reached:

1. Completion of surface preparation.

2. Prior to lining application.

3. During wet and dry film thickness measurements.

4. During pinhole detection testing.

5. During lining repairs.

C. The following quality control tests shall be performed by the Contractor with results recorded and made available to the City:

1. Compressed air quality per blotter test.

2. Environmental conditions prior to lining application, including substrate temperature, ambient temperature, relative humidity and dew point.

3. Observation of surface preparation, including anchor pattern, prior to lining application.

4. Results of ratio check of plural component proportioning equipment.

5. Wet and dry film thickness measurements.

D. The multi-component lining material shall be verified as to proper proportioning of materials at the start of each day and at any time of equipment malfunction before resuming operations. Any necessary site clean-up due to installing improperly reacted materials shall also be made at that time.

E. The following inspection equipment (or City approved equal) shall be utilized by the contractor for performing quality control testing:

1. Sling psychrometer

2. Surface temperature thermometer

3. Ambient temperature thermometer

4. Psychrometric charts for determining relative humidity and dew point

5. High range wet and dry film thickness gages

6. Micrometer

7. Durometer; A and D Scale

8. Sample cans

9. Inspection glass (30 power minimum)

10. High voltage pinhole detector

F. The lining shall be 100% visually inspected for holes, voids, and thin areas.

G. High-voltage discontinuity testing to be performed by Contractor to assure a "pinhole-free" lining system shall be in accordance with NACE Standard RPO188-86, "Discontinuity (Holiday) Testing of Protective Coatings."

H. The contractor shall verify that the applied lining materials has reached cure, as evidenced by hardness, prior to placing into service.

I. When verification of adhesion is required, testing shall be done in accordance with ANSI/ASTM D4541.

3.4 REPAIRS

A. Any damaged areas, faulty areas, or discontinuities (pinholes) found during quality control inspection within a 24-hour (within the recoat window) period of application, and which can be completely repaired within the recoat window, shall be corrected as follows. If repairs will extend beyond the recoat window, use the procedures in Section 3.4.B below.

1. Damaged or Faulty Areas (i.e., impact damage, off-ratio application, etc.): Solvent clean area thoroughly, extending at least six inches beyond damaged area with MEK, Xylene, or Naptha (as allowed) dampened cloth (do not apply excessive solvent to repair area, the intent is to clean only), allow solvent to thoroughly dry. When thoroughly dry to touch, spray area with the lining material to the specified thickness, feathering the material into the existing lining. Note - In the event that the damaged area exhibits a rusty or discolored substrate substandard to the specified requirements, these areas shall receive the same degree of surface preparation required by the original project specifications prior to application of the lining material.

2. Discontinuity (Pinhole) Repair: Solvent clean the immediate area around the detected discontinuity with MEK, Xylene, or Naptha (as allowed) dampened cloth (do not apply excessive solvent to pinhole area, the intent is to clean only), allow solvent to thoroughly dry. Hand apply (putty knife, etc.) a small amount of mixed material directly to the pinhole. For pinhole repairs, hand mix and thoroughly blend a small amount (normally two or three ounces at a time, for each applicator) of Part A and Part B in correct ratios.

B. Any damaged areas, faulty areas, or discontinuities (pinholes) found during quality control inspection AFTER 24 hours of lining installation (exceeding recoat window) shall be corrected as follows:

1. Abrade the surface using abrasive blast or power tools, as practical, down to and including exposed bare steel to remove surface shine, to roughen

the surface, and to prepare the substrate to the original standard. Abraded area shall extend at least six inches (15 cm.) beyond damaged or faulty area. After abrading the surface, vacuum or blow down with clean, dry compressed air thoroughly to remove all loose particles. Solvent clean the area thoroughly, extending at least six inches (15 cm.) beyond the damaged area with MEK, Xylene, or Naptha (as allowed) dampened cloth (do not apply excessive solvent to pinhole area, the intent is to clean only), allow solvent to thoroughly dry. When thoroughly dry to touch, spray area with the lining material to the specified thickness, feathering the material into the existing prepared lining.

2. Discontinuity (Pinhole) Repair shall be completed following the guidelines listed in Section 3.4.A.2 above.

****END OF SECTION****

SECTION 03 41 00

PRECAST CONCRETE STRUCTURES

PART 1 GENERAL

1.1 WORK INCLUDED

A. Work required under this section consists of furnishing and installing precast, reinforced concrete structures of the sizes and types called for on the Plans, complete with openings, inserts, and hardware

1.2 RELATED WORK

A. Section 03 33 15 – Concrete Sidewalk, Curb & Gutter

B. Section 08 30 01 – Access Hatches

C. Section 31 23 16 – Trenching, Backfilling and Compacting

D. Section 40 05 23 – Valves and Appurtenances

1.3 REFERENCES

A. American Concrete Institute (ACI)

B. American Society for Testing and Materials (ASTM)

C. State Standard Specifications

D. California Building Code (CBC)

1.4 SUBMITTALS

A. Submittals shall be in accordance with the Standard General and Special Provisions.

B. Manufacturer's descriptive details of the manufacturer's latest standard product proposed for use on this project, including, but not limited to:

1. All principal dimensions.
2. Knockout locations and dimensions.
3. Hardware details.
4. Certification that the cement conforms to ASTM C150.

C. Shop and erection drawings, including design criteria and calculations, locations and types of all inserts, and the locations of all openings and location and type of joints.

1. The calculations and design drawings shall be stamped and signed by a civil or structural engineer registered in the State of California.

1.5 DEFECTIVE WORK

A. Work considered to be defective may be ordered, by the Engineer, to be replaced in which case the Contractor shall remove and replace the defective work at his expense.

PART 2 PRODUCTS

2.1 GENERAL

A. Design all precast structures as specified herein and in accordance with the applicable requirements of ASTM C913, except that Type II modified Portland cement shall be used.

B. Structures shall be of the sizes and configurations shown on the Drawings, with openings as shown. Wall and floor thickness, roof thickness and joint location shall be determined by the fabricator.

C. Precast concrete Valve Vault 7'X 7' and H-20traffic rated lid.

D. Precast concrete Pumping Bypass Vault B1730 Christy Box w/ B1730-51JH cover and extension or Engineer approved equal.

PART 3 EXECUTION

3.1 GENERAL:

A. Precast structures shall be set vertically and in true alignment, at the elevations indicated and at the locations shown on the Plans

B. All holes in sections used for handling purposes shall be thoroughly plugged with rubber plugs or mortar.

C. If starter couplings are not supplied, place pipe sections flush on the inside of the structure wall, projecting outside sufficiently for proper connection with the next pipe section

D. Follow manufacture's recommended installation procedures.

END OF SECTION

SECTION 05 50 00

FABRICATED METAL

PART 1 GENERAL

1.1 WORK INCLUDED

A. Provide metals work for pipe supports and fittings and other miscellaneous metal works, complete as indicated, specified and required.

1. Steel channel and/or angle frames and thresholds with anchors
2. Pipe supports with saddles, hangers, bracing and attachments as detailed and required, except as provided by other trades
3. Miscellaneous iron and steel items indicated, specified, or required for completion of the Work, unless included under other Sections of the Specification
4. Miscellaneous connections, bolts, clips, spacers, nuts, washers, shapes and inserts, as required
5. Galvanizing, shop primer finishes for work of this Section as specified or required, including field touchups.

1.2 RELATED WORK

A. Section 03 41 00 – Precast Concrete Structures

1.3 REFERENCES

A. Industry Codes and Standards

<u>American Institute of Steel Construction (AISC)</u>

Specification for the Design, Fabrication and Erection of Steel for Buildings

Code of Standard Practice for Steel Buildings and Bridges

<u>American Society for Testing and Materials (ASTM)</u>

<u>American Welding Society (AWS)</u>

AWS D 1.1 Structural Welding Code Steel

B. Government Regulations

<u>U.S. Department of Labor, Occupational Safety and Health Administration (OSHA)</u>

<u>Cal/OSHA Standards</u>

1.4 QUALITY ASSURANCE

A. Unless otherwise specified all work specified herein and shown on the Drawings shall conform to the applicable requirements of the following specifications and codes:

1. Fabricate and erect miscellaneous metal work in accordance with the latest edition of the AISC “Specification for the Design, Fabrication and Erection of Steel for Buildings,” and “Code of Standard Practice for Steel Buildings and Bridges.”

2. Inspections. Perform all field welding and field high strength bolting of structural steel assemblies under the inspection of the Engineer. Notify the Engineer at least 48 hours in advance of needed inspections. Provide copies of testing and inspection reports to the Engineer.

1.5 SUBMITTALS

A. Furnish submittals, samples and material data in conformance with the Standard General and Special Provisions.

1. Shop Drawings and Erection Drawings. Show materials and specification list, construction and fabrication details, layout and erection diagrams and method of anchorage to adjacent construction. Give location, type, size and extent of welding and bolted connections and clearly distinguish between shop and field connections. Coordinate shop drawings with related trades to ensure proper mating of assemblies.

   a. Catalog work sheets showing illustrated cuts of item to be furnished, scale details and dimensions may be submitted for standard manufactured items.

   b. Where items must fit and coordinate with finished surfaces and/or constructed spaces, take measurements at site and not from Drawings. Where concrete, masonry or other materials must be set to exact locations to receive work, furnish assistance and direction necessary to permit other trades to properly locate their work. Where welded connectors, concrete, or masonry inserts are required to receive work, show on shop drawings exact locations required.

2. Shop Painting Data. Submit product list with product data sheets of intended shop coats.

PART 2 PRODUCTS

2.1 MATERIALS – GENERAL

A. Provide materials that are new, sound and conforming to the following:

Item	ASTM Standard No.	Class, Grade Type or Alloy No.
Cast Iron		
Cast Iron	A 48	Class 40B
Steel		
Galvanized sheet iron or steel	A 653	Coating G90
Black steel, sheet or strip	A 569 A 570	--
Coil (plate)	A 635	--
Structural plate, bars, rolled shapes, and miscellaneous items (except W shapes)	A 36	--
Rolled W shapes	A 992	Grade 50
Standard bolts, nuts and washers	A 307	--
High strength bolts, nuts and hardened flat washers	A 325 A 490	--
Eyebolts	A 489	Type 1
Tubing, cold-formed	A 500	--
Tubing, hot-formed	A 501	--
Steel pipe	A 53	Grade B
Stainless steel		
Plate, sheet and strip	A 240	Type 304* or 316**
Bars and shapes	A 276	Type 304* or 316**
Aluminum		
Flashing sheet aluminum	B 209	Alloy 5005-H-14, 0.032 inches minimum thickness
Structural sheet aluminum	B 209	Alloy 6061-T6
Structural aluminum	B 209 B 308	Alloy 6061-T6
Extruded aluminum	B 221	Alloy 6063-T42
*Use Type 304L if material will be welded **Use Type 316L if material will be welded		

1. Anchor bolts:

   a. Anchorages for all locations unless otherwise indicated on Drawings: Stainless steel, Type 316, Hilti HVA adhesive anchors, or Engineer approved equivalent.

   b. Chemical bond or adhesive type DBDs, if approved by the manufacturer and the Engineer, are acceptable for anchorage of vibrating machinery or equipment.

2. Expansion Anchors.

   a. Hilti Kwik-Bolt, Standard Type or Engineer approved equivalent.

3. Galvanizing.

a. Iron and Steel. ASTM A123, with average weight per square foot of 2.0 ounces and not less than 1.8 ounces per square foot.

b. Ferrous Metal Hardware Items. ASTM A153 with average coating weight of 1.3 ounces per sq. ft.

c. Touch-up Material for Galvanized Coatings. Repair galvanized coatings marred or damaged during erection or fabrication by use of DRYGALV as manufactured by the American Solder and Flux Company, Galvalloy, Galvion, Rust-Oleum 7085 Cold Galvanizing Compound, or Engineer approved equivalent.

4. Welding Electrodes. Use welding electrodes conforming to AWS D1.1.

PART 3 EXECUTION

3.1 GENERAL FABRICATION AND INSTALLATION REQUIREMENTS

A. Standards: Thoroughly clean ferrous metals of all loose scale and rust before being fabricated. Provide finished members free of twists, bends or open joints, and that present a neat workmanlike appearance when completed. Perform steel work conforming to the best practices set forth in the “Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings” of the American Institute of Steel Construction.

1. Perform aluminum work conforming to the applicable requirements of “Specifications for Aluminum Structures, Aluminum Construction Manual” of the Aluminum Association.

B. Welding: Perform all welding in accordance with the “Structural Welding Code-Steel,” AWS D1.1.

1. Use only welders qualified by tests in accordance with AWS B 3.0.

C. General Fabrication and Installation

1. Using new stock of sizes specified or detailed, fabricate in shop producing high grade metal work. Form and fabricate to meet required conditions. Include clips, straps, bolts, screws, and other fastenings necessary to secure the work. Accurately make and tightly fit joining and intersections in true planes with adequate secure fastenings. Erect all metal work plumb, true on line and in its designated location. Grind and finish smooth field welds on exposed surface. Bolt or weld connections as indicated on Drawings. After installation, leave all work in a neat and clean condition, ready for field painting or coating.

a. The maximum misalignment tolerance for railing shall be 1/8 inch in 12 feet. Bent, deformed or otherwise damaged railings shall be replaced.

2. Coordinate work of this Section with related trades. Particular attention is required for items to be embedded in concrete work. Provide all punching and drillings indicated or required for attachment of other work to that of this Section.

3. Compliance with Safety Requirements: Dimensions required for the fabrication and installation of handrails, ladders, grating, plate, pipe hangers and etc. which are not shown on the Drawings, shall conform to the requirements of the Division of Occupational Health and Safety.

D. Protection

1. Provide protection and repair of adjacent surfaces and areas which may become damaged as a result of work of this Section. Protect work performed hereunder until completion and final acceptance of project by the Owner. Repair or replace all damaged or defective work to original specified condition, at no additional cost to the Owner.

E. Painting

1. Apply all products in strict conformance with manufacturer's printed instructions.

2. Provide one or more shop coats of paint on all ferrous metals, except cast-iron, ductile iron, stainless steel and galvanized metals. Before priming, thoroughly clean surfaces. Allow shop coats to dry before materials are loaded for delivery to the job site. After erection, paint all areas where the shop coats have been rubbed off or in conformance with manufacturer's recommendations.

END OF SECTION

SECTION 08 30 01

SEWER LIFT STATION ACCESS HATCHES

PART 1 GENERAL

1.1 WORK INCLUDED

A. Lift Station, and valve vault access hatches.

1.2 RELATED WORK

A. Section 03 41 00: Precast Concrete Structures

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM)

1.4 SUBMITTALS

A. Submit shop drawings in accordance with the General and Special Provisions.

B. Product Data: Fully describe all items proposed for use.

C. Shop Drawings: Show dimensions, attachments, inserts and relationship of work to adjoining construction.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Applicable Occupational Safety and Health Regulations, latest edition of California Building Code.

1.6 GUARANTEE

A. Furnish a written guarantee effective for a period of one year after final acceptance of the project that floor hatches will not leak and will be free of defects in materials and workmanship.

PART 2 PRODUCTS

2.1 ACCESS HATCHES

A. Single Leaf: U.S.F. Fabrication Wet Well Lid with Access Hatch and Safety Grates; or approved equal.

B. Double Leaf: Bilco Model "JD-H20-R"; or approved equal.

C. Door Leaves: 1/4-inch (6.35 mm) thick aluminum diamond pattern, reinforced as required to H20 loading.

D. Frame: 1/4-inch (6.35 mm) thick steel channel with anchor flange around perimeter.

E. Doors: Equip with stainless steel hinges, stainless steel pins, spring operators and an automatic hold-open arm with a positive automatic latch that will secure the door in the open position until the release handle is activated. Submit details of latch for review. Provide snap-lock with removable handle. Provide steel recessed hasp to door and frame where required for padlock.

F. Odor Control Gasket: A continuous EPDM gasket shall be affixed to the frame and form an odor-resistant barrier around the entire perimeter of the cover.

G. Provide stainless steel hold-open pin through holes in hold-open arms to insure against accidental hatch closure. Attach pin to hatch with a short stainless steel chain to prevent loss.

H. Safety Chain: Provide a stainless steel safety chain between double leaf doors at opposite end from latch.

I. All hardware: Stainless steel throughout. Provide four (4) keys as spares.

J. Warning Sign: Provide a 10-inch x 12-inch minimum size sign permanently attached to the underside of hatch doors reading: "Danger: Make Sure Hold-Open Latch is Positively Engaged Before Using. Insert Pin in Holes in Hold-Open Arms to Hold Door Open.

PART 3 EXECUTION

3.1 INSTALLATION:

A. Deliver hatches to job site in time for installation.

B. Set frame level and true to plane at all four corners, and flush with adjacent finished surfaces. Doors, when closed, shall be flush with frames and flush with each other.

C. Install warning sign.

END OF SECTION

SECTION 26 05 00

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes

1. Provide all labor, materials and equipment necessary to complete the installation required for the items specified under Division 26.

B. Related work under this section

1. Labor and materials required to furnish and install the electrical systems in a complete and operational fashion.

2. Carpentry, masonry, steel and concrete materials and labor required for construction of proper stands, bases and supports for electrical materials and equipment.

3. Cutting and patching of holes required by installation including flashing and counter-flashing of roof and exterior wall penetrations.

4. Excavating, pumping and backfilling required for installation.

5. Repair of damage to the premises resulting from construction activities under this Section to Owner's satisfaction.

6. Removal of work debris from construction activities to Owner's satisfaction.

7. Testing and cleaning of equipment installed.

C. Work not under this section

1. Furnishing of motors, pumps, fans, compressors, water heaters, thermostats and motor starters included under Division 40, or as noted otherwise.

2. Finish painting of exposed metal surfaces included under Division 9, or as otherwise noted.

3. Electrical Contractor shall provide connections to mechanical equipment where voltage exceeds 50 V and all necessary raceways for low voltage controls.

D. Related sections

1. Where items specified in other Division 26 sections conflict with the requirements of this Section, the most stringent requirement shall govern.

2. The requirements of this Section apply to all Division 26 work, as applicable.

1.2 REFERENCES

A. Comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:

1. CCR –California Code of Regulations

a. Title 8 –Industrial Relations; Section 1 –Department of Industrial Relations

1) Chapter 3.2 -California Occupational Safety and Health Regulations (CAL/OSHA)

2) Chapter 4 –Section of Industrial Safety

a) Subchapter 4 -Construction Safety Orders (CSO)

b) Subchapter 5 -Electrical Safety Orders (ESO)

b. Title 24 –California Building Standards

1) Part 1 -Building Standards Administrative Code

2) Part 2 -California Building Code (CBC); International Building Code (IBC) with California amendments

3) Part 3 -California Electrical Code(CEC); NFPA 70 National Electrical Code (NEC) with California amendments

4) Part 4 -California Mechanical Code (MEC); IAPMO Uniform Mechanical Code (UMC) with California amendments

5) Part 5 -California Plumbing Code; IAPMO Uniform Plumbing Code (UPC) with California amendments

6) Part 6 -California Energy Code

7) Part 7 -California Elevator Safety Construction Code

8) Part 9 -California Fire Code; International Fire Code (IFC) with California amendments

9) Part 12 -California Reference Standards Code

2. CPUC –California Public Utilities Commission

a. GO-95; Rules for Overhead Electric Line Construction

b. GO-128; Rules for Construction of Underground Electric Supply and Communication Systems

3. IEEE –Institute of Electrical and Electronic Engineers

a. C2; National Electrical Safety Code (NESC)

4. NECA –National Electrical Contractors Association

a. 1; Standard Practices for Good Workmanship in Electrical Contracting

b. 4090; Manual of Labor Units

5. All applicable local municipal codes and ordinances.

6. Applicable rules and regulations of local utility companies.

1.3 SUBMITTALS

A. Product Data

1. 1. Refer to General and Special Provisions.

B. Closeout Submittal

1. Furnish three complete sets of maintenance and operating instructions bound in a binder and indexed to Owner. Start compiling data upon approval of materials and equipment. Final inspection will not be made until Engineer approves binders. Refer also to General and Special Provisions for additional requirements.

2. Provide one of each tool required for proper equipment operation and maintenance provided under this Division. All tools shall be delivered to the Owner at project completion.

3. Provide two keys to Owner for each lock furnished under Division 26.

4. As-Built Drawings

a. Refer to General and Special Provisions.

1.4 SUBSTITUTIONS

A. Refer to General and Special Provisions.

1.5 CHANGE ORDER PROPOSALS

A. Refer to General and Special Provisions.

B. All change order proposals and requests, both additive and deductive, shall be accompanied by a detailed materials and labor breakdown for each specific task and/or item.

1.6 QUALITY ASSURANCE

A. References to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies shall mean that latest edition of such publications adopted and published prior to bid submittal. Such codes or standards shall be considered a part of this Specification as though fully repeated herein.

B. Work and materials shall be in full accordance with the latest rules and regulations of applicable state of local laws or regulations and standards of following:

1. National Fire Protection Association (NFPA)

2. California Electrical Code (CEC)

3. California Occupational Safety Health Act (Cal-OSHA)

4. California State Fire Marshall (CSFM)

5. California Code of Regulations (CCR)

6. Electrical Safety Orders, CAC Title 8 (ESO)

7. California Public Utilities Commissions, General Order 95 (GO-95)

8. Applicable rules and regulations of local utility companies.

9. NECA 1-2006, Standard Practices for Good Workmanship in Electrical Contracting

C. All electrical equipment and material furnished under Division 26 shall conform to all CEC requirements and bear the Underwriters' Laboratories (UL) label where applicable.

D. Nothing in the Contract Documents shall be construed to permit work not conforming to these Codes. Whenever the indicated material, workmanship, arrangement or construction is of high quality or capacity than that required by the above rules and regulations, the Contract Documents shall take precedence. Should there be any direct conflict between the rules and regulations and Contract Documents, the rules shall govern.

E. All electrical equipment and material furnished under this Division shall conform to NEMA and ASTM standards, CEC and bear the Underwriters' Laboratories (UL) label where such label is applicable.

F. All electrical work shall conform to manufacturer's written instruction, and the NECA Standard Practices for Good Workmanship in Electrical Contracting and all published recommended practices at the time of project. The Contractor shall use the requirements within the Specifications whenever they exceed NECA guidelines.

G. Follow manufacturer's direction where these direction cover points not included with the Contract Documents.

1.7 DELIVERY, STORAGE AND HANDLING

A. Packing, shipping, handling and unloading

1. Damage to the equipment delivered to the site or in transit to the job shall be the responsibility of the Contractor.

2. Equipment and material delivery of shall be scheduled as required for timely, expeditious progress of work.

B. Storage and protection of job equipment is the responsibility Contractor.

C. Comply with General and Special Provisions requirements with regards to waste management and disposal.

1.8 PROJECT CONDITIONS

A. Discrepancies

1. In the event of discrepancies with the Contract Documents, Engineer shall be notified with sufficient time as stated within General and Special Provisions to allow the issuing of an addendum prior to the bid opening.

2. If, in the event that time does not permit notification of clarification of discrepancies prior to the bid opening, the following shall apply:

a. The drawings govern in matters of quantity and specifications govern in matters of quality.

b. In the event of conflict within the drawings and specifications involving quantities or quality, the greater quantity or higher quality shall apply. Such discrepancies shall be noted and clarified within the contractor’s bid. No additional allowances will be made because of errors, ambiguities or omissions which reasonably should have been discovered during the bid preparation.

B. Verify all power and communication utilities’ requirements prior to commencement of any utility work. Make proper adjustments to the construction to satisfy the serving utility.

C. Information shown relative to services is based upon available records and data, but shall be regarded as approximate only. Make minor deviations found necessary to conform to actual locations and conditions without extra cost. Verify locations and elevations of utilities prior to commencement of excavation for new underground installation.

D. Exercise extreme care in excavating near existing utilities to avoid any damage thereto; be responsible for any damage caused by such operations. Contact all utility companies to obtain exact locations prior to commencement of construction.

E. The electrical plans indicate the general layout and arrangement; the field conditions shall determine exact locations. Field verify all conditions and modify as required to satisfy design intent. Maintain all required working clearances.

F. Fees, permits and utility services

1. Obtain and pay for all permits and service charges required for the installation of this work. Arrange for required inspections and secure approvals from authorities having jurisdiction. Arrange for all utility

connections and pay charges incurred including excess service charges if any.

2. Extra charges imposed by the electrical and communication utility companies shall be included in the bid, if available. Unless otherwise stated, these charges will be assumed to include in the bid.

G. Provide and maintain temporary construction power. The General Contractor will pay for electric energy charges. Should the Electrical Contractor be the prime contractor, the Electrical Contractor shall pay for energy charges unless negotiated with Owner.

1.9 SEQUENCING

A. Coordinate work within phasing plans as provided by the Owner.

1.10 WARRANTY

A. Refer to General and Special Provisions.

PART 2 PRODUCTS

2.1 MATERIALS

A. Materials mentioned herein or on Drawings require that the items be provided and of quality noted or an approved equal. All materials shall be new, full weight, standard in all respects and in first-class condition. Insofar as possible, all materials used shall be of the same brand or manufacturer throughout for each class of material or equipment.

B. Trade names or catalog numbers stated herein indicates grade or quality of material desired. Materials, where applicable, shall be UL labeled and in accordance with NEMA standards.

C. Dimensions, sizes and capacities shown are a minimum. Do not make changes without written permission of Engineer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine Construction Documents and Site; be familiar with types of construction where electrical installation is involved. Note carefully other sections of Specifications with their individual cross-references, standard details, etc.

B. Any electrical work or materials shown either in Construction Documents, but not mentioned herein, or vice versa, shall be executed the same as if mentioned herein, in a workmanlike manner in accordance with all published NECA Standards of Installation.

C. Coordinate work with other crafts to avoid conflicts, and check all outlet locations with drawings and specifications. Make minor adjustments without additional cost to Owner.

D. Engineer will make clarifications and rulings concerning any obvious discrepancies or omissions in work prior and after bidding. Perform all work involved in correcting obvious errors or omissions after award of contract as directed by Engineer at Contractor's expense.

E. Examine site dimensions and locations against Drawings and become informed of all conditions under which work is to be done before submitting proposals. No allowance will be made for extra expense due to error.

F. Layouts of equipment, accessories and wiring systems are diagrammatic (not pictorial), but shall be followed as closely as possible. Construction Documents are for assistance and guidance, and exact locations, distance, levels, etc., will be governed by construction; accept same with this under standing.

G. Horsepower of motors or wattage of equipment indicated in Construction Documents is estimated horsepower or wattage requirement of equipment furnished under other sections of Specifications. Size all feeders (conduit and wiring), motor starters, overload protection and circuit breakers to suit horsepower of motors or wattage of equipment actually furnished under various sections of specifications. However, in no case shall feeders and branch circuits (conduit and wiring) and circuit breakers be of smaller capacities or sizes than those indicated on Drawings or specified, unless approved in writing by Engineer.

3.2 PREPARATION

A. Seal all exterior wall penetrations in an approved watertight manner and to the satisfaction of Engineer and Owner.

B. Channels, joiners, hangers, caps, nuts and bolts and associated parts shall be plated electrolytically with zinc followed immediately thereafter by treating freshly deposited zinc surfaces with chromic acid to obtain a surface which will not form a white deposit on surface for an average of 120 hours when subjected to a standard salt spray cabinet test, or shall be hot dipped galvanized

3.3 INSTALLATION

A. Equipment identification

1. Properly identify panelboards, remote control switches, push buttons, terminal boxes, etc. with a descriptive nameplate. Make nameplate with 3/32” laminated plastic with black background and white letters. Machine engraved letters 1/8” high for equipment in device box(es) and 1/4” high for panelboards, terminal cabinets or larger items. Punched strip type nameplates and cardholders in any form are not acceptable. Fasten nameplates with oval head machine screws, tapped into front cover/panel.

B. Working spaces

1. Provide adequate working space around electrical equipment in compliance with Article 4 of Electrical Safety Orders and CEC 110.26. In general provide 78” of headroom and 30” wide minimum clear workspace in front of panelboards and controls. In addition to the above, provide the following minimum working clearances:

   a. 0V – 150V (line-to-ground) provide 36” minimum clear distance.

   b. 151V – 600V (line-to-ground) provide 42” minimum clear distance.

C. Equipment supports

1. Anchor all electrical equipment to structure. Support systems shall be adequate to withstand seismic forces per CBC.

D. Excavating and backfilling

1. Excavate and backfill as required for installation of Work. Restore all surfaces, roadways, walks, curbs, walls existing underground installations, etc., cut by installations to original condition in an acceptable manner. Maintain all warning signs, barricades, flares and lanterns as required by ESO and local ordinances.

2. Dig trenches straight and true to line and grade, with bottom clear of any rock points. Support conduit for entire length on undisturbed original earth. Minimum conduit depth of pipe crown shall be 24” below finished or natural grade, unless otherwise noted.

E. Forming, cutting and patching

1. In new construction, Contractor shall provide any special forming, recesses, chased, etc., and provide wood blocking, backing and grounds as necessary for the proper installation of electrical work. Be responsible for notifying Contractor that such provision is necessary; layout work and check to see that it suits his requirements.

   a. Provide metal backing plates, anchor plates and such that are required for anchorage of electrical work under Division 26; securely weld or bolt to metal framing. Wood blocking or backing will not be permitted in combination with metal framing.

2. Be responsible for proper placement of pipe sleeves, hangers, inserts and supports for this Work.

F. Concrete work

1. Provide concrete work related solely to electrical work. Concrete work, including forming and reinforcing steel installed for all electrical work, shall comply with all applicable requirements of Division 03, or in accordance with the State of California Standard Specifications issued by the Department of Transportation (CALTRANS).

3.4 REPAIR/RESTORATION

A. Cutting, patching and repairing of existing construction to permit installation of work under Division 26 is the responsibility of Contractor. Repair or replace all damage to existing work in kind to Owner's satisfaction.

B. Obtain Engineer's approval prior to performing any cutting or patching of concrete, masonry, wood or steel structure within building.

3.5 FIELD QUALITY CONTROL

A. Inspection of work

1. Working parts shall be readily accessible for inspection, repair and renewal. The right is reserved to make reasonable changes in equipment location shown on Drawings prior to rough in without additional costs to the Owner.

2. During construction all work will be subject to observation by the Engineer and his representatives. Assist in ascertaining any information that maybe required.

3. Do not allow or cause any work installed hereunder to be covered up or enclosed before it has been inspected and approved. Should any work be enclosed or covered prior to approval, uncover work, and after it has been inspected and approved, restore work of all others to the condition in which it was found at the time of cutting, all without additional costs to Owner.

B. Furnish all testing equipment as maybe required.

C. Test all wiring and connections for continuity and grounds; where such tests indicate faulty insulation or other defects, locate, repair and re-test.

D. Check rotation of all motors and correct if necessary.

3.6 CLEANING

A. Repair or replace all broken, damaged or otherwise defective parts without additional cost to Owner, and leave entire work in a condition satisfactory to Engineer. At completion, carefully clean and adjust all equipment, fixtures and trim installed as part of this work; leave systems and equipment in satisfactory operating condition.

B. Clean out and remove from the site all surplus materials and debris resulting from this work; this includes surplus excavated materials.

3.7 DEMONSTRATION

A. At project completion, Contractor shall allot a period of not less than 8 hours per well site for instruction of operating and maintenance personnel in the use of all systems installed under this Division. This time is in addition to any instruction time stated in the Specifications of other sections for other equipment (i.e., fire alarm, security, intercom, etc.). All personnel shall be instructed at one time, the

Contractor shall make all necessary arrangements with manufacturer's representatives as may be required. Contractor, if any, for the above services shall pay all costs.

3.8 PROTECTION

A. In performance of work, protect work of other trades as well as work under this Division from damage.

B. Protect electrical equipment, stored and installed, from dust, water or other damage.

END OF SECTION

SECTION 26 05 19

CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes

1. Provide all labor, materials and equipment necessary for the installation of all conductors and cables under this Section related to lighting, power, mechanical, control and signal systems.

B. Related sections

1. Where items specified in other Division 26 sections conflict with the requirements of this Section, the most stringent requirement shall govern.

2. The requirements of this Section apply to all Division 26 work, as applicable.

3. Consult all other sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete installation.

1.2 REFERENCES

A. Comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:

1. ASTM -American Society for Testing and Materials

a. B3; Standard Specification for Soft or Annealed Copper Wire

b. B8; Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

c. B787/B787M; Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation

d. D1000; Standard Test Method for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications

2. CCR –California Code of Regulations, Title 24

a. Part 3 -California Electrical Code(CEC); NFPA 70 National Electrical Code (NEC) with California amendments

3. UL -Underwriters Laboratories, Inc.

a. UL 83; Thermoplastic-Insulated Wire and Cables

b. UL 486A 486B; Wire Connectors

c. UL 486C; Splicing Wire Connectors

d. UL 486D; Standard for Insulated Wire Connector Systems For Underground Use Or In Damp Or Wet Locations

e. UL 486E; Standard for Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors

f. UL 493; Thermoplastic-Insulated Underground Feeders and Branch Circuit Cables

g. UL 510; Standard for Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape

h. UL 854; Service-Entrance Cables

4. NEMA –National Electrical Manufacturer's Association

a. WC 70-1999; Nonshielded Power Cables Rated 2000 Volts or less for the Distribution of Electrical Energy

5. IEEE –Institute of Electrical and Electronic Engineers

a. 82; Standard Test Procedure for Impulse Voltage Tests on Insulated Conductors

1.3 DELIVERY

A. Wire shall be in original unbroken package. Obtain approval of Inspector or Engineer before installation of wires.

PART 2 PRODUCTS

2.1 BUILDING WIRE

A. Conductor material

1. Provide annealed copper for all wire, conductor and cable of not less than 98% conductivity.

2. Wire #8 AWG and larger shall be stranded.

3. Wire #10 AWG and smaller shall be solid.

B. Insulation material

1. All insulated wire, conductor and cable shall be 600 Vac rated.

2. Feeder and branch circuits larger than #6 AWG shall be type THW, XHHW or THHN/THWN.

3. Feeder and branch circuits #6 AWG and smaller shall be type TW, THW, XHHW or THHN/THWN.

4. Control circuits shall be type THW or THHN/THWN.

5. Wires shall bear the UL label, be color-coded and marked with gauge, type and manufacturer’s name on 24” centers.

2.2 FLEXIBLE CORDS AND CABLES

A. Provide flexible cords and cables of size, type and arrangement as indicated on Drawings.

B. Type S flexible cords and cable shall be manufactured in accordance with CEC Article 400 and composed of two or more conductors and a full sized green insulated grounding conductor with an outer rubber or neoprene jacket.

C. Flexible cords and cables shall be fitted with wire mesh strain relief grips either as a integral connector component or an independently supported unit.

D. Suspended flexible cords and cables shall incorporate safety spring(s).

2.3 WIRE CONNECTIONS AND TERMINATIONS

A. Electrical spring wire connectors

1. Provide multi-part construction incorporating a non-restricted, zinc coated square cross-sectional steel spring enclosed in a steel sheet with an outer jacket of plastic and insulating skirt.

2. Self-striping pigtail and tap U-contact connectors are not acceptable.

B. Compression type terminating lugs

1. Provide tin-plated copper high compression type lugs for installation with hand or hydraulic crimping tools as directed by manufacturer. Notch or single point type crimps are not acceptable.

2. Two hole, long barrel lugs shall be provided for size #4/O AWG and larger wire where terminated to bus bars. Use minimum of three crimps per lug where possible.

C. Splicing and insulating tape

1. Provide black, UV resistant, self extinguishing, 7 mil thick vinyl general purpose electrical tape per UL 510 and ASTM D1000. 3M Scotch 33 or equal.

D. Insulating putty

1. Provide pads or rolls of non-corrosive, self-fusing, 125 mil thick rubber putty with PVC backing sheet per UL 510 and ASTM D1000. 3M Scotchfil or equal.

E. Insulating resin

1. Provide two-part liquid epoxy resin with resin and catalyst in pre-measured, sealed mixing pouch. 3M Scothcast 4 or equal.

2. Use resin with thermal and diaelectric properties equal to the cable's insulating properties.

F. Terminal strips

1. Provide box type terminal strips in the required quantities plus 25% spare. Install in continuous rows.

2. Use the box type terminal strips with barrier open backs and with ampere ratings as required.

3. Identify all terminals strips and circuits.

G. Crimp type connectors

1. Provide insulated fork or ring crimp terminals with tinned electrolytic copper-brazed barrel with funnel wire entry and insulation support.

2. Fasten crimp type connectors or terminals using a crimping tool recommended by the manufacturer.

3. Provide insulated overlap splices with tinned seamless electrolytic copper-brazed barrel with funnel wire entry and insulation support.

4. Provide insulated butt splices with tinned seamless electrolytic copper-brazed barrel with center stop, funnel wire entry and insulation support.

H. Cable ties

1. Provide harnessing and point-to-point wire bundling with nylon cable ties. Install using tool supplied by manufacturer as required.

I. Wire lubricating compound

1. UL listed for the wire insulation and conduit type, and shall not harden or become adhesive.

2. Shall not be used on wire for isolated type electrical power systems.

J. Bolt termination hardware

1. Bolts shall be plated, medium carbon steel heat-treated, quenched and tempered equal to ASTM A-325 or SAE Grade 5; or silicon bronze alloy ASTM B-9954 Type B.

2. Nuts shall be heavy semi-finished hexagon, conforming to ANSI B18.2.2, threads to be unified coarse series (UNC), class 2B steel or silicon bronze alloy.

3. Flat washers shall be steel or silicon bronze, Type A plain standard wide series, conforming to ANSI B27.2. SAE or narrow series shall be used.

4. Belleville conical spring washers shall be hardened steel, cadmium plated or silicon bronze.

5. Each bolt connecting lug(s) to a terminal or bus shall not carry current exceeding the following values:

    a. 1/4” bolt – 125 A

    b. 5/16” bolt – 175 A

    c. 3/8” bolt – 225 A

    d. 1/2” bolt – 300 A

    e. 5/8” bolt – 375 A

    f. 3/4” bolt – 450 A

PART 3 EXECUTION

3.1 EXAMINATION

A. Thoroughly examine site conditions for acceptance of wire and cable installation to verify conformance with manufacturer and specification tolerances. Do not commence with work until all conditions are made satisfactory.

3.2 INSTALLATION

A. All wire, conductor, and cable with their respective connectors, fittings and supports shall be UL listed for the installed application and ambient conditions.

B. Feeders and branch circuits in wet locations shall be rated 75°C minimum.

C. Feeders and branch circuits in dry locations shall be rated 90°C minimum.

D. Minimum conductor size

    1. #12 AWG copper for all power and lighting branch circuits.

2. #14 AWG copper for all line voltage signal and control wiring, unless otherwise indicated.

E. Remove and replace conductors under the following conditions at no additional costs to the Owner:

1. Installed within wrong specified conduit or raceway.

2. Damaged during installation.

3. Of insufficient length to facilitate proper splice of conductors

3.3 WIRING METHODS

A. Install wires and cable in accordance with manufacturer's written instructions, as shown on Drawings and as specified herein.

B. Install all single conductors within raceway system, unless otherwise indicated.

C. Parallel circuit conductors and terminations shall be equal in length and identical in all aspects.

D. Provide adequate length of conductors within electrical enclosures and neatly train to termination points with no excess. Terminate such that there is no bare conductor at the terminal.

E. Splice cables and wires only in junction boxes, outlet boxes, pull boxes, manholes or handholes.

F. Group and bundle with tie wrap each neutral with its associated phase conductors where more than one neutral conductor is present within a conduit.

G. Install cable supports for all vertical feeders in accordance with CEC Article 300. Provide split wedge type fittings, which firmly clamp each individual cable and tighten due to cable weight.

H. Seal cable where exiting a conduit from an exterior underground raceway with a non-hardening compound (i.e., duct seal or equal).

I. Provide UL listed factory fabricated, solder-less metal connectors of size, ampacity rating, material, type and class for applications and for services indicated. Use connectors with temperature ratings equal or greater than the conductor or cable being terminated.

J. Stranded wire shall be terminated using fittings, lugs or devices listed for the application. Under no circumstances shall stranded wire be terminated solely by wrapping it around a screw or bolt.

K. Flexible cords and cables supplied as part of a pre-manufactured assembly shall be installed according to manufacturer's published instructions.

3.4 WIRING INSTALLATION IN RACEWAYS

A. Install wire in raceway after interior of building has been physically protected from weather, and all mechanical work likely to injure conductors has been completed.

B. Pull all conductors into raceway at the same time.

C. Use UL listed, non-petroleum base and insulating type pulling compound as needed.

D. Completely mandrel all underground or concrete encased conduits prior to installation.

E. Completely and thoroughly swab raceway system prior to installation

F. Do not use block and tackle, power driven winch or other mechanical means for pulling conductors smaller than #1 AWG.

G. Wire pulling

1. Provide installation equipment that will prevent cutting or abrasion of insulation during installation.

2. Maximum pull tension shall not exceed manufacturer's recommended value during installation for cable being measured with tension dynometer.

3. Use rope made of non-metallic material for pulling.

4. Attach pulling lines by means of either woven basket grips or pulling eyes attached directly to the conductors.

5. Pull multiple conductors simultaneously within same conduit.

3.5 WIRE SPLICES, JOINTS AND TERMINATIONS

A. Join and terminate wire, conductors and cables in accordance with UL 486, CEC and manufacturer's instructions.

B. Thoroughly clean wires before installing lugs and connectors.

C. Make splices, taps and terminations to carry full conductor ampacity without perceptible temperature rise, and shall be made mechanically and electrically secure.

D. Terminate wires in terminal cabinets using terminal strips, unless otherwise indicated.

E. Insulate spare conductors with electrical tape and leave sufficient length to terminate anywhere within panel or cabinet.

F. Encapsulate splices in wet locations using specified insulating resin kits.

G. Make up all splices and taps in accessible junction or outlet boxes with connectors as specified herein. Pigtails and taps shall be the same color as feed conductor with at least 6 inches of tail, all neatly packed within box.

H. Where conductors are to be connected to metallic surfaces, coated surfaces shall be cleaned to base metal surface before installing connector. Remove lacquer coating of conduits where ground clamps are to be installed.

I. Branch circuits (#10 AWG and smaller) connectors shall comply with 2.03.A and 2.03.B above.

J. Branch circuits (#8 AWG and larger)

1. Join or tap conductors using insulated mechanical compression taps with pre-molded, snap-on insulating boots or specified conformable insulating pad and over-wrapped with two half-lapped layers of vinyl insulating tape starting and ending at the middle of joint.

2. Terminate conductors using mechanical compression lugs in accordance with manufacturer's recommendation or as specified elsewhere.

3. Field installed compression connectors for 250 MCM and larger shall have not less than two clamping elements or compression indents per wire.

4. Insulate splices and joints with materials approved for the particular use, location, voltage and temperature.

K. Termination hardware assemblies

1. Al/Cu lugs connected to aluminum plated or copper bus shall be secured with steel bolt, flat washer (two per bolt), Belleville washer and nut.

2. Copper lugs connected to copper buss shall bus shall be secured using silicon bronze alloy bolt, flat washer (two per bolt), Belleville washer and nut.

3. The crown of Belleville washers shall be under the nut.

4. Bolt assemblies shall be torque to manufacturer's recommendations. Where manufacturer recommendation is not obtainable, the following shall be used:

a. 1/4" -20 bolt at 80 inch-pound torque

b. 5/16" -18 bolt at 180 inch-pound torque

c. 3/8" -20 bolt at 20 inch-pound torque

d. 1/2" -20 bolt at 40 inch-pound torque

e. 5/8" -20 bolt at 55 inch-pound torque

f. 3/4” -20 bolt at 158 inch-pound torque

3.6 IDENTIFICATION

A. Securely tag all branch circuits. Mark conductors with specified vinyl wrap-around markers. Where more than two conductors run through a single outlet, mark each conductor with the corresponding circuit number.

B. Provide all terminal strips with each individual terminal identified using specified vinyl markers.

C. In manholes, pullboxes and handholes provide tags of embossed brass type with cable type and voltage rating. Attach tags to cable with slip-free plastic cable lacing units.

D. Color coding

1. For 120/208 Volt (or 120/240 Volt), 1 phase, 3 wire systems:

a. Phase A – Black

b. Phase B – Red

c. Neutral – White

d. Ground – Green

2. For 120/208 Volt, 3 phase, 4 wire systems:

a. Phase A – Black

b. Phase B – Red

c. Phase C – Blue

d. Neutral – White

e. Ground – Green

3. For 277/480 Volt, 3 phase, 4 wire systems:

a. Phase A – Brown

b. Phase B – Orange

c. Phase C – Yellow

d. Neutral – Gray

e. Ground – Green

4. Switch leg individually installed shall be the same color as the branch circuit to which they originate, unless otherwise indicated.

5. Travelers for 3-way and 4-way switches shall be a distinct color and pulled with the circuit switch leg or neutral.

3.7 FIELD QUALITY CONTROL

A. Supply labor, materials and test equipment required to perform continuity and ground tests.

B. Electrical testing

1. Perform feeder and branch circuit insulation test after installation and prior to connection to device.

2. Tests shall be performed by 600 Vdc megger for a continuous 10 seconds from phase-to-phase and phase-to-ground.

3. Torque test conductor connections and terminations for conformance to Specifications.

4. If any failure is detected, locate failure, determine cause and replace or repair cable to Engineer's satisfaction at no additional costs.

5. Furnish test results in type written report form for review by Engineer.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes

1. Provide all labor, materials and equipment necessary to complete the installation required for the item specified under this Section, including but not limited to power system grounding

B. Related sections

1. Where items specified in other Division 26 sections conflict with the requirements of this Section, the most stringent requirement shall govern.

2. The requirements of this Section apply to all Division 26 work, as applicable.

3. Consult all other sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete installation.

1.2 REFERENCES

A. Comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:

1. CCR –California Code of Regulations, Title 24

a. Part 3 -California Electrical Code (CEC); NFPA 70 National Electrical Code (NEC) with California amendments

2. IEEE –Institute of Electrical and Electronic Engineers

a. 142; Recommend Practices for Grounding of Industrial and Commercial Power Systems

3. NFPA –National Fire Protection Association

a. 780; Lightning Protection Code

4. UL –Underwriters Laboratories, Inc.

a. 467; Grounding and Bonding Equipment

1.3 SYSTEM DESCRIPTION

A. This Section provides for the grounding and bonding of all electrical and communication apparatus, machinery, appliances, components, fittings and accessories where required to provide a permanent, continuous, low impedance, grounded electrical system.

B. Ground the electrical service system neutral at service entrance equipment as shown on the Drawings.

C. Ground each separately derived system, as defined in CEC 250.5 (D) and on the Drawings, unless specifically noted otherwise.

D. Except as otherwise indicated, the complete electrical installation including the neutral conductor, equipment and metallic raceways, boxes and cabinets shall be completely and effectively grounded in accordance with all CEC requirements, whether or not such connections are specifically shown or specified.

1.4 SUBMITTALS

A. Submit manufacturer's data for equipment and materials specified within this Section in accordance to Section 26 05 00.

1.5 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the materials specified herein shall be new and unused, bearing UL labels where applicable.

PART 2 PRODUCTS

2.1 CONCRETE ENCASED GROUNDING ELECTRODE (UFER GROUND)

A. #3/O AWG minimum bare stranded copper conductor.

2.2 DRIVEN (GROUND) RODS

A. Copper clad steel, minimum ¾" diameter by 10'-0" length, sectional type with copper alloy couplings and carbon steel driving stud; Weaver, Cadweld or equal.

2.3 INSULATED GROUNDING BUSHINGS

A. Plated malleable iron body with 150°C molded plastic insulated throat and lay-in ground lug; OZ/Gedney BLG, Thomas & Betts #TIGB series or equal.

2.4 CONNECTION TO PIPE

A. Cable to pipe connections; OZ/Gedney G-100B series, Thomas & Betts #290X series or equal.

2.5 CONNECTIONS TO STRUCTURAL STEEL, GROUND RODS OR SPICES

A. Where required by the Drawings, grounding conductors shall be spliced together, connected to ground rods or connected to structural steel using exothermic welds, Cadweld or equal, or high pressure compression type connectors, Cadweld, Thomas & Betts or equal.

2.6 BONDING JUMPERS

A. OZ/Gedney Type BJ, Thomas & Betts #3840 series or equal.

2.7 GROUND CONDUCTOR

A. Ground conductor shall be code size UL labeled, Type THWN insulated copper wire, green in color.

PART 3 EXECUTION

3.1 INSTALLATION

A. Grounding electrodes

1. Concrete encased grounding electrode (Ufer ground)

a. Provide a #3/O AWG minimum bare copper conductor encased along the bottom of concrete foundation, footing or trench which is in direct contact with the earth and where there is no impervious waterproofing membrane between the footing and soil. The electrode shall extend through a horizontal length of 30' minimum and shall be encased in not less than 2" or more than 5" of concrete separating it from surrounding soil. The electrode shall emerge from the concrete slab through a protective non-metallic sleeve and shall be extended to BGB or as shown on Drawings.

2. Supplementary grounding electrode (ground ring, grid and driven rod)

a. Provide as shown driven ground rod(s). Interconnect ground rod with structural steel and adjacent rods with code size bare copper conductor. Ground rods shall be space no less than 6'-0" on centers from any other electrode or electrodes of another electrical system.

3. Separately derived electrical system grounding electrode

a. Ground each separately derived system per CEC 250-26 or as shown on Drawings, whichever is greater.

4. Metal underground water pipe

a. Contractor shall install am accessible grounding electrode conductor from the main incoming cold water line to BGB. The electrode conductor shall be sized per CEC Table 250-94 or as shown on Drawings, whichever is greater.

B. Grounding electrode conductor

1. Provide grounding electrode conductors per CEC Table 250-94 or as shown on Drawings, whichever is greater.

C. Power system grounding

1. Connect the following items using code size copper grounding conductors as shown on Drawings:

a. Concrete encased electrode (Ufer ground)

b. Ground rod(s)

c. Incoming cold and fire water pipes

d. Structural steel

e. Distribution transformer secondary

D. Equipment Bonding/Grounding

1. Provide a code sized copper ground conductor, whether indicated or noted on the drawings, in each of the following:

a. All power distribution conduits and ducts

b. Distribution feeders

c. Motor and equipment branch circuits

d. Device branch circuits

2. Provide a separate grounding bus at distribution panelboards, loadcenters, switchboards and motor control centers. Connect all metallic enclosed equipment so that with maximum fault current flowing, shall be maintained at not more than 35V above ground.

3. Metallic conduits terminating in concentric, eccentric or oversized knockouts at panelboards, cabinets, gutters, etc. shall have grounding bushings and bonding jumpers installed interconnecting all such conduits.

4. Provide bonding jumpers across expansion and deflection coupling in conduit runs, pipe connections to water meters and metallic cold water dielectric couplings.

5. Provide ground wire in flexible conduit connected at each end via grounding bushing.

6. Provide bonding jumpers across all cable tray joints.

7. Bond each end of metallic conduit longer than 36” in length to grounding conductor using a #6 AWG pigtail.

3.2 FIELD QUALITY CONTROL

A. Contractor using test equipment expressly designed for that purpose shall perform all ground resistance tests in conformance with IEEE quidelines. Contractor shall submit typewritten records of measured resistance values to Engineer for review and approval prior to energizing the system.

B. Obtain and record ground resistance measurements both from electrical equipment ground bus to the ground electrode and from the ground electrode to earth. Furnish and install additional bonding and add grounding electrodes as required to comply with the following resistance limits:

1. Resistance from ground bus to ground electrode and to earth shall not exceed 5 ohms unless otherwise noted.

2. Resistance from the farthest panelboard, loadcenter, switchboard or motor control center ground bus to the ground electrode and to earth shall not exceed 20 ohms maximum.

C. Inspection

1. The Engineer or Inspector prior to encasement, burial or concealment thereto shall review the grounding electrode and connections.

END OF SECTION

SECTION 26 05 33

RACEWAYS AND BOXES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes

1. Provide all labor, materials and equipment necessary to complete the installation required for the items specified under this Section, including but not limited to electrical conduits; outlet, junction and pull boxes; and related supports.

B. Related sections

1. Where items specified in other Division 26 sections conflict with the requirements of this Section, the most stringent requirement shall govern.

   a. 26 05 26 – Grounding and Bonding for Electrical Systems

2. The requirements of this Section apply to all Division 26 work, as applicable.

3. Consult all other sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete installation.

1.2 REFERENCES

A. Comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:

1. ANSI –American National Standards Institute

   a. C33.91; Specification for Rigid PVC Conduit

   b. C80.1; Specification Rigid Steel Conduit, Zinc-Coated

   c. C80.3; Specification for Electrical Metallic Tubing, Zinc-Coated

   d. C80.6; Intermediate Metal Conduit (IMC), Zinc-Coated

2. CCR –California Code of Regulations, Title 24

   a. Part 2 -California Building Code (CBC); International Building Code (IBC) with California amendments

   b. Part 3 -California Electrical Code(CEC); NFPA 70 National Electrical Code (NEC) with California amendments

3. NECA –National Electrical Contractors Association

   a. 101, Standard for Installing Steel Conduit (Rigid, IMC, EMT)

   b. 111, Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC) (ANSI)

4. NEMA –National Electrical Manufacturer’s Association

   a. FB 1; Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable

   b. FB 2.10; Selection and Installation Guidelines for Fittings for Use with Non-flexible Electrical Metal Conduit or Tubing (Rigid Metal Conduit, Intermediate Metal Conduit, and Electrical Metallic Tubing)

   c. FB 2.20; Selection and Installation Guidelines For Fittings for Use With Flexible Electrical Conduit and Cable

   d. OS 1; Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports

   e. OS 3; Selection and Installation Guidelines for Electrical Outlet Boxes

   f. RN 1; Polyvinyl-Chloride Externally Coated Galvanized Rigid Steel Conduit and Electrical Metallic Tubing

   g. TC 2; Electrical Plastic Tubing and Conduit

   h. TC 3; PVC Fittings for Use with Rigid PVC Conduit and Tubing

   i. TC 14; Reinforced Thermosetting Resin Conduit (RTRC) and Fittings

5. OSHPD Anchorage Pre-approvals

   a. OPA-0003; Superstrut Seismic Restraint System

   b. OPA-0114; B-Line Seismic Restraints

   c. OPA-0120; Unistrut Seismic Bracing System

   d. OPA-0242; Power-Strut Seismic Bracing System

6. UL –Underwriter’s Laboratories, Inc.

   a. 1; Standard for Flexible Metal Conduit

   b. 6; Rigid Metal Electrical Conduit

   c. 360; Standard for Liquid-Tight Flexible Steel Conduit

   d. 514A; Metallic Outlet Boxes, Electrical

e. 514B; Fittings for Conduit and Outlet Boxes

f. 651; Schedule 40 & 80 PVC Conduit

g. 797; Electrical Metallic Tubing

h. 1242; Intermediate Metal Conduit

i. 1684; Reinforced Thermosetting Resin Conduit (RTRC) and Fittings

1.3 SYSTEM DESCRIPTION

A. Furnish, assemble, erect, install, connect and test all electrical conduits and related raceway apparatus required and specified to form a complete installation.

1.4 SUBMITTALS

A. Submit manufacturer's data for materials specified within this Section in accordance to Section 26 05 00.

1.5 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the materials specified herein shall be new and unused, bearing UL labels where applicable.

B. Installation shall conform to the NECA installation guidelines unless otherwise indicated within this Section

PART 2 PRODUCTS

2.1 MATERIALS

A. Conduits and Fittings

1. Rigid steel conduit (RMC)

a. Conduit: Standard weight, mild steel pipe, and zinc coated on both inside and outside by a hot dipping or sheardizing process manufactured in accordance with UL 6 and ANSI C80.1 specifications.

b. Fittings (couplings, elbows, bends, etc.)

1) Shall be steel or malleable iron.

2) Coupling and unions shall be threaded type, assembled with anti-corrosion, conductive and anti-seize compound at joints made absolutely tight to exclude water.

c. Bushings

1) Insulating bushings: Threaded polypropylene or thermosetting phenolic rated at 150°C minimum.

2) Insulating grounding bushing: Threaded cast body with insulating throat and steel “lay-in” ground lug.

3) Insulating metallic bushing: Threaded cast body with plastic insulated throat rated at 150°C minimum.

2. Coated rigid steel conduit (CRMC)

a. Conduit: Equivalent to RMC with a Polyvinyl chloride (PVC) coated bonded to the galvanized outer surface of the conduit. The bonding between the PVC coating and conduit surface shall be ETL PVC-001 compliant. The coating thickness shall be a minimum of 40mil.

b. Fittings (couplings, elbows, bends, etc.)

1) Equivalent to RMC above with bonded coating same as conduit.

2) The PVC sleeve over fittings shall extend beyond hub or coupling approximately one diameter or 1 1/2” whichever is smaller.

c. Bushing equivalent to RMC above.

3. Electrical metallic tubing (EMT)

a. Conduit: Cold rolled steel tubing with zinc coating on outside and protective enamel on inside manufactured in accordance with UL 797 and ANSI C80.3 specifications.

b. Couplings: Steel or malleable iron with compression type fastener via a nut.

c. Connectors: Steel or malleable iron with compression type fastener via a nut with plastic insulated throat rated at 150°C minimum.

4. Rigid non-metallic conduit (PVC)

a. Conduit: PVC composed Schedule 40, 90°C manufactured in accordance with NEMA TC 2 and UL 651 specifications.

b. Fittings: Molded PVC, slip on solvent welded type in accordance to NEMA TC 3.

5. Liquidtight flexible metallic conduit (LFMC)

a. Conduit: PVC coated, continuous, flexible steel spirally wound with zinc coating on both inside and outside in accordance with UL 360.

b. Connectors: Steel or malleable iron with compression type fastener via a nut with plastic insulated throat rated at 150°C minimum.

6. Miscellaneous Fittings and Products

a. Conduit sealing bushings: Steel or cast malleable iron body and pressure clamps with PVC sleeve, neoprene sealing grommets and PVC coated steel pressure rings. Supplied with neoprene sealing rings between body and PVC sleeve.

b. Watertight cable terminators: One piece, compression molded sealing ring with PVC coated steel pressure disks, stainless steel screws and zinc plated cast iron locking collar.

c. Watertight cable/cord connectors: Liquidtight steel or cast malleable iron body with sealing neoprene bushing and stainless steel retaining ring.

d. Expansion fittings: Multi-piece unit of hot dip galvanized malleable iron or steel body and outside pressure bussing design to allow a maximum of 4” movement (2” in either direction). Furnish with external braid tinned copper bonding jumper. UL listed for both wet and dry locations.

e. Expansion/deflection couplings: Multi-piece unit comprised of a neoprene sleeve, internal flexible tinned copper braid attached to bronze end couplings with stainless steel bands. Coupling to provide minimum of 3/4” movement and 30 degrees deflection from normal. UL listed for both wet and dry locations.

f. Conduit bodies: Raintight, malleable iron, hot-dip galvanized body with threaded hubs, stamped steel cover, stainless steel screws and neoprene gasket.

g. Other couplings, connectors and fittings shall be equal in quality, material and construction to items specified herein.

B. Boxes

1. Outlet boxes

a. Standard: Galvanized one-piece of welded pressed steel type in accordance with NEMA OS 1 and UL 514. Boxes shall not be less than 4” square and at least 1 1/2” deep.

b. Concrete: Galvanized steel, 4” octagon ring with mounting lug, backplate and adapter ring type in accordance with NEMA OS 1 and UL 514. Depth as required by application.

c. Masonry: Galvanized steel, 3.75” high gang box in accordance with NEMA OS 1 and UL 514.

d. Surface cast metal: Cast malleable iron body, surface mounted box with threaded hubs and mounting lugs as required in accordance with

NEMA OS 1 and UL 514. Furnish with ground flange, steel cover and neoprene gasket.

2. Pull and junction boxes

   a. Sheet metal boxes: Standard or concrete outlet box wherever possible; otherwise use 16 gauge galvanized sheet metal, NEMA 1 box sized per CEC with machine screwed cover.

   b. Cast metal boxes: Install standard cast malleable iron outlet or device box when possible.

   c. Flush mounted boxes: Install overlapping cover with flush head screws.

   d. In-ground mounted pull holes/boxes: Install pre-cast concrete box, sized per Drawing or CEC with pre-cast or traffic rated lid.

C. Pull line/cord

1. Polypropylene braided line or Let-line #232 or equal of 1/8” diameter with a minimum break strength of 200 pounds.

PART 3 EXECUTION

3.1 EXAMINATION

A. Thoroughly examine site conditions for acceptance of wire and cable installation to verify conformance with manufacturer and specification tolerances. Do not commence with work until all conditions are made satisfactory.

3.2 PREPARATION

A. Conduit

1. Provide all necessary conduit fittings, connectors, bushings, etc. required to complete conduit installation to meet the CEC and intended application whether noted, shown or specified within.

2. Location of conduit runs shall be planned in advance of the installation and coordinated with other trades.

3. Where practical, install conduits in groups in parallel vertical or horizontal runs that avoid unnecessary offsets.

4. All conduits shall be parallel or at right angles to columns, beams and walls whether exposed or concealed.

5. Conduits shall not be placed closer than 12” to a flue, parallel to hot water, steam line or other heat sources; or 3” when crossing perpendicular to the above said lines when possible.

6. Install exposed conduit as high as practical to maintain adequate headroom. Notify Engineer if headroom will be less than 102”.

7. Do not obstruct spaces required by Code in front of electrical equipment, access doors, etc.

8. The largest trade size conduit in concrete floors and walls shall not exceed 1/3 thickness or be spaced a less than three conduit diameters apart unless permitted by Engineer. All conduits shall be installed in the center of slab or wall, and never between reinforcing steel and bottom of floor slab.

9. Install additional pull boxes, not shown on Drawings, in sufficient quantities to facilitate pulling of conductors and cables such that total spacing does not exceed 150 feet or 270 degrees, total; and maximum pulling tension will not be exceeded.

10. When installing underground conduits to specified depth; depth shall be taken from finished grade as it will be at project completion. Should finish grade be above existing grade by an amount equal to or greater than specified depth, conduit shall be installed not less than 6” below existing grade.

11. Verify that information concerning finish grade is accurate, for should the underground run be less than the specified depth, Contractor may be required to re-install conduit to meet the required depth.

12. Unless otherwise specified, underground conduits shall be installed with top side not less than 24” below finished grade; this depth applies to all conduits outside of building foundations including those under walks, open corridors or paved areas.

13. Utility company service conduits installation depth shall be as directed by their respective specifications and requirements.

B. Boxes

1. Before locating outlet boxes, check Contract Documents for type of construction and make sure that there is no conflict with other equipment. Locate outlet boxes as shown and locate so as not to interfere with other Work or equipment.

2. Install all outlet boxes flush within walls, ceiling and floors except where installed within non-finished rooms, cabinetry, attic spaces or as indicated on Drawings.

3. Locate pull boxes and junction boxes within concealed, accessible locations where possible.

4. Adjust position of outlet boxes within masonry wall to accommodate course lines.

3.3 INSTALLATION

A. Conduit

1. Minimum conduit size shall be 3/4” unless otherwise indicated.

2. All conduit work shall be concealed unless otherwise indicated. Exposed conduits shall be permitted within unfinished rooms/spaces to facilitate installation.

3. Install conduit in complete runs prior to installing conductors or cables.

4. Make long radius conduits bends free from kink, indentations or flattened surfaces. Make bends carefully to avoid injury or flattening. Bends 1 1/4” size and larger shall be factory made ells, or be made with a manufactured mechanical bender. Heating of steel conduit to facilitate bending or that damage galvanized coating will not be permitted.

5. Remove burrs and sharp edges at end of conduit with tapered reamer.

6. Protect and cover conduits during construction with metallic bushings and bushing “pennies” to seal exposed openings.

7. Assemble conduit threads with anti-corrosion, conductive, anti-seize compound and tighten securely.

8. Install conduits shall that no traps to collect condensation exist.

9. Fasten conduit securely to boxes with locknuts and bushings to provide good grounding continuity.

10. Install pull cords/line within any spare or unused conduits of sufficient length to facilitate future cable installation.

11. Penetrations

    a. Locate penetrations within structural members as shown on Drawings and as directed by Engineer. Should it be necessary to notch any framing member, make such notching only at locations and in a manner as approved by Engineer.

    b. Do not chase concrete or masonry to install conduit unless specifically approved by Engineer.

    c. Cutting or holes

        1) Install sleeves for cast-in-place concrete floors and walls. After installing conduit through penetration, seal using dry-pack grouting compound (non-iron bearing, chloride free and non-shrinking) or fire rated assembly if rated floor or wall. Use escutcheon plate on floor underside to contain compound as necessary.

2) Cut holes with a hole saw for penetrations through non-concrete or non-masonry members.

3) Provide chrome plated escutcheon plates at all publicly exposed wall, ceiling and floor penetrations.

d. Sealing

1) Non-rated penetration openings shall be packed with non-flammable insulating material and sealed with gypsum wallboard taping compound.

2) Fire rated penetration shall be sealed using a UL classified fire stop assembly suitable to maintain the equivalent fire rating prior to the penetration.

3) Use escutcheon plates to hold sealing or fire rated compound as necessary.

e. Waterproofing

1) Make penetrations through any damp-proofed/waterproofed surfaces within damp/wet locations as such as to maintain integrity of surface.

2) Install specified watertight conduit entrance seals at all below grade wall and floor penetrations.

3) At roof penetrations furnish roof flashing, counter flashing and pitch-pockets compatible to roof assembly.

4) Where possible conduits that horizontally penetrate a waterproof membrane shall fall away from and below the penetration’s exterior side.

5) Make penetrations through floors watertight with mastic, even when concealed within walls or furred spaces.

12. Supports

a. Conduits shall be support and braced per OSHPD pre-approved anchorage systems when those methods are implemented and installed.

b. Sizes of rods and cross channels shall be capable of supporting 4 times and 5 times actual load, respectively. Anchorage shall support the combined weight of conduit, hanger and conductors.

c. Support individual horizontal conduit 1 1/2” and smaller by means of 2 hole straps or individual hangers.

d. Galvanized iron hanger rods sizes 1/4” diameter and larger with spring steel fasteners, clips or clamps specifically design for that purpose for 1 1/2” conduits and larger.

e. Support multi-parallel horizontal conduits runs with trapeze type hangers consisting of 2 or more steel hanger rods, preformed cross channels, ‘J’ bolts, clamps, etc.

f. Support conduit to wood structures by means of bolts or lag screws in shear, to concrete by means of insert or expansion bolts and to brickwork by means of expansion bolts.

g. Support multi-parallel vertical conduits runs with galvanized Unistrut, Power-Strut or approved equal type supports anchored to wall. Where multi-floored conduits pass through floors, install riser clamps at each floor.

h. Maximum conduit support spacing shall be in accordance with NECA Standard of Installation:

1) Horizontal runs:

a) 3/4” and smaller at 60” on centers, unless building construction prohibits otherwise, then 84” on centers.

b) 1” and larger at 72” on centers, unless building construction prohibits otherwise or any other condition, then 120” on centers.

2) Vertical runs:

a) 3/4” and smaller @ 84” on centers.

b) 1” and 1 1/4” @ 96” on centers.

c) 1 1/2” and larger @ 120” on centers.

d) Any vertical condition such as shaftways and concealed locations for any sized conduit, 120” on centers.

i. Anchorage for RMC/IMC supports unless otherwise specified:

1) < 1” IMC/RMC = #10 bolt/screw.

2) 1” IMC/RMC = 1/4” bolt/screw.

3) 1 1/2” and 2” IMC/RMC = 3/8” bolt/screw.

4) 3” IMC/RMC, 4” EMT = 1/2” bolt/screw.

5) > 3”IMC/RMC = 5/8” bolt/screw.

j. Anchorage for EMT supports unless otherwise specified:

1) < 1 1/2” EMT = #10 bolt/screw.

2) 1 1/2” EMT = 1/4” bolt/screw.

3) 2, 2 1/2” and 3” EMT = 3/8” bolt/screw.

4) 4” EMT = 1/2” bolt/screw.

5) > 4”EMT = 5/8” bolt/screw.

B. Boxes

1. Install boxes as shown on Drawings and as required for splices, taps, wire pulling, equipment connections and Code compliance.

2. Install additional pull boxes, not shown on Drawings, in sufficient quantities to facilitate pulling of conductors and cables such that total spacing does not exceed 150 feet or 270 degrees, total; and maximum pulling tension will not be exceeded.

3. Install plaster rings on all outlet boxes in stud walls or in furred, suspended or exposed ceilings. Covers shall be of a depth suited for installation.

4. Provide gasketed cast metal cover plates where boxes are exposed in damp or wet locations

5. Install access door for boxes installed within concealed locations without access.

6. Install approved factory made knockout seal where knockouts are not present.

7. Refer to Architectural interior elevations and details shown for exact mounting heights of all electrical outlets. In general, locate outlets as shown or specific and complies with Americans with Disabilities Act:

   a. Convenience outlets: +18"AFF or +6" above counter or splash.

   b. Local switches: +48"AFF or +6" above counter or splash.

   c. Telecommunication outlets: +18"AFF or +48"AFF for wall telephone or intercom device.

   d. Verify all mounting heights with Drawings, and where heights are not suited for construction or finish please consult Engineer.

8. Use conduit bodies to facilitate pulling of conductor or cables or change conduit direction. Do not splice within conduit bodies.

9. Enclose pull box with additional rated gypsum board as necessary to maintain wall's original fire rating.

10. Install galvanized steel coverplates on all open boxes within dry listed areas.

11. Install in-ground pull holes/boxes flush to grade finish at finished areas or 1" above finished landscaped grade. Seal all conduits terminating in pull hole/box watertight. Install and grout around bell ends where shown. Cover and lids shall be removable without damage to adjacent finish surfaces.

12. Support

a. Accurately place boxes for finish, independently and securely supported by adequate blocking or manufacturer channel type heavy-duty box hangers for stud walls. Do not use nails to support boxes.

b. Support boxes independent of conduit system.

c. Mount boxes installed within ceilings to 16 gauge metal channel bars attached to main runners or joists.

d. Support boxes within suspended acoustical tile ceilings directly from structure above when light fixture are to be installed from box.

e. Use auxiliary plates, bar or clips and grouted in place for masonry, block or pour-in-place concrete construction.

3.4 APPLICATION

A. Conduit

1. RMC suitable for all damp, dry and wet locations except when in contact with earth. IMC not suitable for hazardous locations as stated within CEC.

2. CRMC suitable for damp or wet locations, concealed within concrete or in contact with earth.

3. PVC suitable for beneath ground floor slab, except when penetrating, and direct earth burial. Do not run exposed within concrete walls or in floor slab unless indicated on Drawings or per Engineer’s permission.

4. LFMC application same as FMC above but for damp or wet locations.

B. Termination and joints

1. Use raceway fittings compatible with associated raceway and suitable for the location.

2. Raceways shall be joined using specified couplings or transitions where dissimilar raceway systems are joined.

3. Conduits shall be securely fastened to cabinets, boxes and gutters using (2) two locknuts and insulating bushing or specified insulated connector. Where joints cannot be made tight and terminations are subject to vibration, use bonding jumpers, bonding bushings or wedges to provide electrical continuity of the raceway system. Use insulating bushings to protect conductors where subjected to vibration or dampness. Install grounding bushings or bonding jumpers on all conduits terminating at concentric or eccentric knockouts.

4. Terminations exposed at weatherproof enclosures and cast outlet boxes shall be made watertight using specified connectors and hubs.

5. Stub freestanding equipment conduits through concrete floors for connections with top of coupling set flush with finished floor. Install plugs to protect threads and entrance of debris.

6. Install specified cable sealing bushings on all conduits originating outside the building walls and terminating within interior switchboard, panel, cabinet or gutters. Install cable sealing bushings or raceway seal for conduit terminations in all grade level or below grade exterior pull, junction or outlet boxes.

7. Where conduits enter building from below grade inject into filled raceways pre-formulated rigid 2 lbs. density polyurethane foam suitable for sealing against water, moisture, insects and rodents.

8. Install expansion fitting or expansion/deflection couplings per manufacturer's recommendations where:

    a. Any conduit that crosses a building structure expansion joint; secure conduit on both sides to building structure and install expansion fitting at joint.

    b. Any conduit that crosses a concrete expansion joint; install expansion/deflection at joint.

    c. Any conduit greater than 1-1/4" is routed along roof top in runs greater than 100 feet; install expansion fittings every 100 feet.

    d. Engineer may allow LFMC in lieu of expansion fitting or expansion/deflection couplings on conduits 2" and smaller within accessible locations upon further review and written consent.

C. Boxes

1. Standard type suitable for all flush installations and all dry concealed locations.

2. Concrete type suitable for all flush concrete installations.

3. Masonry type suitable for all flush concrete and block installations.

4. Surface cast meta type suitable for all exposed damp and wet surface mounted locations, and dry surface mounted locations less than 96" from finished floor

END OF SECTION

SECTION 26 18 11

OVERCURRENT PROTECTION DEVICES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes

1. Provide all labor, materials and equipment necessary to complete the installation required for the items specified under this Section, including but not limited to overcurrent protection devices.

B. Related sections

1. Where items specified in other Division 26 sections conflict with the requirements of this Section, the most stringent requirement shall govern.

2. The requirements of this Section apply to all Division 26 work, as applicable.

3. Consult all other sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete installation.

1.2 REFERENCES

A. Comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:

1. CCR –California Code of Regulations, Title 24

a. Part 3 -California Electrical Code(CEC); NFPA 70 National Electrical Code (NEC) with California amendments

2. Federal Specification

a. W-C-375; Circuit Breakers, Molded Case, Branch Circuit And Service

3. NEMA –National Electrical Manufacturer's Association

a. AB 1; Molded-Case Circuit Breakers, Molded Case Switches, and Circuit-Breaker Enclosures

b. PB 2.2; Application Guide for Ground Fault Protective Devices for Equipment

4. UL -Underwriters Laboratories, Inc.

a. 248; Low Voltage Fuses

b. 468; Wire Connectors

c. 508E; IEC Type "2" Coordination Short Circuit Tests

d. 489; Molded-Case Circuit Breakers and Circuit Breaker Enclosures

e. 943; Standard for Ground-Fault Circuit-Interrupters

1.3 SUBMITTALS

A. Submit manufacturer's data for materials specified within this Section in accordance to Section 26 05 00.

B. Production test of circuit breakers upon request of Engineer.

C. Submittal shall show the following information: circuit breaker numbering, circuit breaker type and short circuit rating, provisions for future circuit breakers, bussing, including neutral and ground, ratings and enclosure dimensions and trims.

1.4 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the materials specified herein shall be new and unused, bearing UL labels where applicable.

B. The manufacturing facility shall be registered by Underwriters Laboratories Inc. to the International Organization for Standardization ISO 9002 Series Standards for quality.

1.5 DELIVERY, STORAGE AND HANDLING

A. Handle carefully to avoid damage to internal components, enclosure and finish.

B. Store in a clean, dry environment. Maintain factory packaging and, if required, provide an additional cover to protect enclosure in harsh environments.

PART 2 PRODUCTS

2.1 FUSES

A. All power distribution fuses shall be time-delay, high interrupting (200kAIC minimum) and current limiting type, unless otherwise indicated. All fuses shall be of same manufacturer and model.

1. Motor branch circuit fuses (0 – 600A): UL Class RK5 dual element, time delay type shall be size for UL 508E "Type 2" coordination for the motor controller. Coordinate fuse selection with motor starter overload relay heaters as required.

2. General purpose feeder fuses (0 – 600A): UL Class RK1 dual element, time delay type shall be size per Drawings.

B. Control and instrumentation fuses shall of type and rating as recommended by equipment manufacturer, suitable for fuse blocks or holders installation.

2.2 MOLDED CASE CIRCUIT BREAKERS

A. General

1. Circuit breakers shall be constructed using glass reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.

2. Circuit breakers shall have an over center, trip free, toggle operating mechanism which will provide quick-make, quick-break contact action. The circuit breaker shall have common tripping of all poles.

3. The circuit breaker handle shall reside in a tripped position between ON and OFF to provide local trip indication.

4. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker after installation.

5. Circuit breakers shall have an RMS interrupting capacity not less than shown on Drawings, or if not shown shall not be less than:

   a. 25kA for 480V systems

   b. 22kA for 240V (or less) systems

6. Each circuit breaker shall be equipped with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit breaker tripping mechanism for maintenance and testing purposes.

7. Circuit breakers shall be equipped with UL Listed electrical accessories as noted on Drawing. Circuit breaker handle accessories shall provide provisions for locking handle in the ON and OFF position.

8. All circuit breakers shall be UL Listed for reverse connection without restrictive line and load markings and be suitable for mounting in any position.

9. Circuit breakers shall be constructed with factory installed mechanical lugs. All circuit breakers shall be UL Listed to accept field installable/removable mechanical type lugs. Lug body shall be bolted in place; snap in design not acceptable. All lugs shall be UL Listed to accept solid (not larger than #8 AWG) and/or stranded copper and aluminum conductors. Lugs shall be suitable for 90°C rated wire, sized according to the 75°C temperature rating in the CEC.

10. All circuit breakers shall be capable of accepting bus connections.

B. Thermal-Magnetic Circuit Breakers

1. Circuit breakers shall have a permanent trip unit containing individual thermal and magnetic trip elements in each pole.

2. Thermal trip elements shall be factory preset and sealed. Circuit breakers shall be true RMS sensing and thermally responsive to protect circuit conductor(s) in a 40°C ambient temperature.

3. Circuit breaker frame sizes above 100 amperes shall have a single magnetic trip adjustment located on the front of the circuit breaker.

4. Provide equipment ground fault protection where shown on Drawing with the following features.

    a. Ground fault sensing system shall be modified zero sequence sensing type and not require any external power to trip the circuit breaker.

    b. The ground fault sensing system shall be suitable for use on grounded systems. The ground fault sensing system shall be suitable for use on three-phase, three-wire circuits where the system neutral is grounded but not carried through the system or on three-phase, four-wire systems.

    c. Ground fault pickup current setting and time delay shall be field adjustable. A switch shall be provided for setting ground fault pickup point. A means to seal the pickup and delay adjustments shall be provided.

    d. The ground fault sensing system shall include a ground fault memory circuit to sum the time increments of intermittent arcing ground faults above the pickup point.

    e. A means of testing the ground fault system to meet the on-site testing requirements of CEC 230.95 (C) shall be provided.

    f. Local visual ground fault trip indication shall be provided.

    g. The ground fault sensing system shall be provided with Zone Selective Interlocking (ZSI) communication capabilities compatible with other thermal magnetic circuit breakers equipped with ground fault sensing, electronic trip circuit breakers with integral ground fault sensing and external ground fault sensing systems as noted on Drawings.

C. Electronic Trip Circuit Breakers

1. Circuit breaker trip system shall be a microprocessor-based true RMS sensing design with sensing accuracy through the thirteenth (13th) harmonic. Sensor ampere ratings shall be as indicated on Drawings.

2. The integral trip system shall be independent of any external power source and shall contain no less than industrial grade electronic components.

3. The ampere rating of the circuit breaker shall be determined by the combination of an interchangeable rating plug, the sensor size and the long-time pickup adjustment on the circuit breaker. The sensor size, rating plug and adjustment positions shall be clearly marked on the face of the circuit breaker. Circuit breakers shall be UL Listed to carry 80% (or 100% where noted on Drawings) of their ampere rating continuously.

4. The following time/current response adjustments shall be provided. Each adjustment shall have discrete settings and shall be independent of all other adjustments.

   a. Instantaneous Pickup

   b. Long Time Pickup

   c. Long Time Delay

   d. Short Time Pickup

   e. Short Time Delay

   f. Ground Fault Pickup (when specified with ground fault protection)

   g. Ground Fault Delay (when specified with ground fault protection)

5. A means to seal the trip unit adjustments in accordance with CEC 240.6 (B) shall be provided.

6. Local visual trip indication for overload, short circuit and ground fault trip occurrences shall be provided.

7. An ammeter to individually display all phase currents flowing through the circuit breaker shall be provided. All current values shall be displayed in true RMS with 2% accuracy.

8. Long Time Pickup indication to signal when loading approaches or exceeds the adjusted ampere rating of the circuit breaker shall be provided.

9. The trip system shall include a Long Time memory circuit to sum the time increments of intermittent overcurrent conditions above the pickup point. Means shall be provided to reset Long Time memory circuit during primary injection testing.

10. An ammeter to individually display all phase currents flowing through the circuit breaker shall be provided. Indication of inherent ground fault current flowing in the system shall be provided on circuit breakers with integral ground fault protection. All current values shall be displayed in true RMS with 2% accuracy.

11. Circuit breakers shall be equipped with back-up thermal and magnetic trip system.

12. Equipment Ground Fault Protection shall be provided where noted on Drawings.

    a. Circuit breakers shall be provided with integral equipment ground fault protection for grounded systems. The circuit breaker shall be suitable for use on three-phase, three-wire circuits where the system neutral is grounded but not carried through the system or on three-phase, four-wire systems.

    b. A separate neutral current transformer shall be provided for three-phase, four-wire systems.

    c. Ground fault sensing system shall be residual sensing type.

    d. The trip system shall include a ground fault memory circuit to sum the time increments of intermittent ground faults above the pickup point.

    e. A means of testing the ground fault system to meet the on-site testing requirements of CEC 230.95 (C) shall be provided.

    f. Local visual trip indication for a ground fault trip occurrence shall be provided.

    g. The ground fault sensing system shall be provided with Zone Selective Interlocking (ZSI) communication capabilities compatible with other thermal magnetic circuit breakers equipped with ground fault sensing, electronic trip circuit breakers with integral ground fault sensing and external ground fault sensing systems as noted on Drawings.

13. Circuit breaker trip system shall be equipped with an externally accessible test port. Disassembly of the circuit breaker shall not be required for testing. Test set shall be capable of verifying the operation of all trip functions with or without tripping the circuit breaker.

PART 3 EXECUTION

3.1 PREPARATION

A. Notify Engineer no later than 10 working days for adjustable circuit breaker settings not shown within Drawings. Submit to Engineer the following information:

   1. Panel, switchboard name/ID

   2. Circuit breaker identifier (i.e., main circuit breaker, load served, etc.)

   3. List of necessary settings (i.e., trip settings, time delays, etc.)

3.2 INSTALLATION

A. Install equipment and their accessories in to manufacturer's instructions, pertinent Codes, and with recognized industry practices to insure device operates properly.

B. Tighten electrical connectors and terminals in accordance to manufacturer's requirements. Where the manufacturer does not have published torque tightening values, comply with the requirements of UL 468.

3.3 FIELD QUALITY CONTROL

A. Check tightness of circuit breaker connections using a calibrated torque wrench or torque screwdriver per manufacturer's written specifications.

B. Contractor to obtain the services of an independent testing company who shall provide quality control and adjustments as well as tests for

1. Check each circuit breaker above 100A on a 225A frame for long-time and short-time delay pickup and instantaneous pickup.

   a. Instantaneous pickup current shall be determined by 4 cycles or less.

   b. Perform timing test with 300% of breaker trip unit rated current.

   c. Adjust unit if required, so that the tripping characteristics are within the limits of the published time-current characteristic curves for that particular trip unit.

2. Test and calibrate ground fault protection trip and pickup time on 225A frame breakers and larger.

C. Physically test key interlock systems to check for proper functionality.

D. Check and set where required all protective device settings in accordance with approved coordination study settings and conduct ground fault acceptance tests.

3.4 ADJUSTING

A. Check each circuit breaker above 100A, long-time and short-time delay pickup and instantaneous pickup. Instantaneous pickup current shall be determined by 4 cycles or less. Perform timing test with 300% of breaker trip unit rated current. Adjust unit if required, so that the tripping characteristics are within the limits of Adjust all operating mechanisms for free mechanical movement per manufacturer's specifications.

B. Adjust circuit breaker trip and time delay settings to values indicated as instructed by Engineer.

1. the published time-current characteristic curves for that particular trip unit.

2. Main circuit breaker ground fault setting shall be per CEC 230.95 (A) or as directed by Engineer.

3.5 PROTECTION

A. When directed by Engineer provide physical means to “permanently fix” settings for rotary and DIP type switches with a thin coat of clear lacquer.

3.6 CLEANING

A. Remove marks, dirt and debris from installed equipment surfaces for “new like” appearance.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes

1. Provide all labor, materials and equipment necessary to complete the installation required for the items specified under this Section, including but not limited to wiring devices.

B. Related sections

1. Where items specified in other Division 26 sections conflict with the requirements of this Section, the most stringent requirement shall govern.

    a. 26 05 26 – Grounding and Bonding for Electrical Systems

2. The requirements of this Section apply to all Division 26 work, as applicable.

3. Consult all other sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete installation.

1.2 REFERENCES

A. Comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:

1. Federal Specification

    a. W-C-596; Connector, Electrical, Power, General Specification for

    b. W-S-896; Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification)

2. NEMA –National Electrical Manufacturer's Association

    a. WD 1; General Color Requirements for Wiring Devices

    b. WD 6; Wiring Devices-Dimensional Requirements

3. UL -Underwriters Laboratories, Inc.

    a. 20; General-Use Snap Switches

    b. 498; Standard for Attachment Plugs and Receptacles

c. 943; Standard for Ground-Fault Circuit-Interrupters

d. 1449; Standard for Transient Voltage Surge Suppressors

1.3 SUBMITTALS

A. Submit manufacturer's data for materials specified within this Section in accordance to Section 26 05 00.

1.4 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the materials specified herein shall be new and unused, bearing UL labels where applicable.

PART 2 PRODUCTS

2.1 SWITCHES

A. Wall switches

1. Specification grade, quiet, AC rated, mechanical, snap type with silver alloy contacts, and shall comply with NEMA WD-1 and Fed. Spec W-S-896.

2. Rating shall be 20A at 120/277Vac, unless otherwise shown.

3. Handles shall be nylon; color shall be compatible with adjacent wall finish.

4. Manufacturers and types

a. Single pole, single throw

1) Cooper Wiring Devices #CSB120, Hubbell #CSB120, or equal.

b. Double pole, single throw

1) Cooper Wiring Devices #CSB220, Hubbell #CSB220, or equal.

c. Three way

1) Cooper Wiring Devices #CSB320, Hubbell #CSB320, or equal.

2.2 RECEPTACLES

A. Standards

1. Specification grade, NEMA 5-15R configuration grounding type, rated 15A at 125/250Vac that conform to NEMA WD-6 and Fed. Spec W-C-596.

2. At dedicated receptacle locations and as otherwise noted, use specification grade, NEMA 5-20R configuration grounding type, rated 20A at 125/250Vac that conform to NEMA WD-6 and when possible Fed. Spec W-C-596.

3. Specialty receptacles shall conform to NEMA WD-6 and UL standards as applicable.

B. Color

1. General purpose receptacle face shall be nylon; color shall be compatible with adjacent wall finish, unless otherwise indicated.

C. Receptacle types

1. General purpose single

a. Provide self-grounding back and side wired with binding head staked terminal screw.

b. Use Cooper Wiring Devices #5261, Hubbell #5261, or equal for NEMA 5-15R.

c. Use Cooper Wiring Devices #5361, Hubbell #5361, or equal for NEMA 5-20R.

2. General purpose duplex

a. Provide self-grounding back and side wired with binding head staked terminal screws and break-off strip for two circuit wiring.

b. Use Cooper Wiring Devices #5262, Hubbell #5262, or equal for NEMA 5-15R.

c. Use Cooper Wiring Devices #5362, Hubbell #5362, or equal for NEMA 5-20R.

3. Transient voltage surge suppressor (TVSS) duplex

a. Provide 20A, 125Vac receptacle consisting of NEMA 5-20R duplex device with integral TVSS protection circuit.

b. Provide LED indicator to verify surge protection and ground, and audible alarm to notify bad ground connection or surge protection expiration.

c. TVSS characteristics:

1) 400V clamping voltage.

2) 280J energy rating.

3) 150Vac RMS MOV rating

4) 18kA maximum surge current in all modes (L-N, L-G and N-G)

d. Use Cooper Wiring Devices #5362_S, no known equal.

4. Isolated ground

a. Provide receptacle specified within this Section with equipment grounding contacts connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap.

5. Ground fault circuit interrupter (GFCI) duplex

a. Provide 20A, 125Vac receptacle consisting of NEMA 5-20R duplex device with integral solid state sensing and signaling circuitry capable of detecting and interrupting a maximum 5mA line-to-ground fault current in approximately 1/40th of a second per UL 943.

b. Provide visual device with trip indication, manual reset and test mechanisms per UL 943.

c. Device shall be capable of point of use and multi-outlet protection.

d. Use Cooper Wiring Devices #XGF20, Hubbell #GF53, or equal.

6. Special purpose

a. Provide specification grade devices with NEMA configuration, voltage, ampacity, poles and ground provisions as noted on Drawings.

2.3 WALL PLATES

A. Interior locations

1. Finished Areas: 0.032” stainless steel, brushed or satin finish with required number of openings for location.

2. Exposed Areas: galvanized, raised type.

B. Exterior: die-cast copper-free aluminum, gasketed, raintight cover UL listed for exterior and wet locations while in use. Use Hubbell #WP8M (duplex), #WP26M (GFCI) or equal.

C. Screws shall match plate.

D. Tamper resistance receptacles shall have exposed screws of tamper resistant type.

E. Individual, gangable wall plates are not acceptable where two or more devices are installed at one location.

PART 3 EXECUTION

3.1 PREPARATION

A. Coordinate device heights with drawings and details.

B. Locate switches on latch side of door, unless otherwise indicated.

3.2 INSTALLATION

A. Mount and align device and wall plates level and plumb. Insure wall plates fit flat against wall and tight against device without strain on plate.

B. Comply with manufacturer's instructions regarding termination of conductors to wiring device.

C. Provide wall plates for all outlet boxes with devices.

D. Install blank wall plates on all outlet boxes in which no device is present or installed.

END OF SECTION

SECTION 31 23 16

TRENCHING, BACKFILLING, AND COMPACTING

PART 1 GENERAL

1.1 WORK INCLUDED

A. This section includes material, and installation for trench excavation, backfilling and compacting.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 32 11 23 - Aggregate Base

1.3 REFERENCES

A. ANSI/ASTM C136 – Sieve Analysis of Fine and Coarse Aggregates.

B. ANSI/ASTM D1557 – Moisture-Density Relations of Soils and Sol-Aggregate Mixture Using 10 lb (4.54 kg) Hammer and 18-inch (457 mm) Drop.

C. ANSI/ASTM D1556 – Density of Soil and base rock in Place by Sand-Cone Method.

D. ASTM D 2922 and D – 3017 Density of soil and base rock in place by Nuclear method.

E. ASTM D 2937 –Density of soil and in place by Tube method.

F. Section 26 – Aggregate Bases, State Standard Specifications.

1.4 PROTECTION

A. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavation.

1. Trenches shall have sloping, sheeting, shoring, and bracing conforming with 29CFR1926, Subpart P—Excavations, CAL/OSHA requirements, and the Contract Documents.

B. Notify Engineer of unexpected subsurface conditions.

C. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.

D. When the pipe laying is not in progress, including the noon hours, close the open ends of pipe. Do not allow trench water, animals or foreign material to enter the pipe.

1.5 SUBMITTALS

A. Submit plans as required for worker protection against caving ground in excavations.

B. Submittals shall be in accordance with the General and Special Provisions.

1.6 CONTROL AND DIVERSION OF WATER

A. General – The Contractor shall furnish or procure all materials and labor required for constructing and maintaining all temporary diversion and protective works and shall furnish, install, maintain, and operate all necessary pumping and other equipment for removal of water from the various parts of the work and for maintaining the foundations and other parts of the work free from water.

B. Plan – Prior to beginning any work on the removal of water from trenches, the Contractor shall submit for the Engineer's approval a water control plan showing his proposed method for the removal of water from trenches and other parts of the work.

C. Dispose of the water in a manner that will prevent damage to the adjacent property and in accordance with regulatory requirements.

D. Do not drain trench water through the pipeline under construction.

1.7 PROJECT CONDITIONS

A. Underground utilities may exist at this site. Contractor shall take all necessary precautions to protect said utilities. Notify Engineer of any deviation in utility location from that which is shown on the drawings.

B. Obtain all required permits and licenses before installing utilities and follow the rules and requirements of the authority having jurisdiction.

C. Arrange construction sequences to provide the shortest practical time that the trenches will be open to avoid hazard to the public, and to minimize the possibility of trench collapse

PART 2 MATERIALS

2.1 SELECT AND IMPORT MATERIAL IN PIPE AND BEDDING ZONE

A. Pea Gravel: Natural stone; washed, free of clay, shale, organic matter; 1/4-inch minimum to 5/8-inch maximum size.

B. Sand: Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, and organic matter, graded in accordance with Section 90-3, State Standard Specifications, within the following limits:

Sieve Size	Percent Passing By Weight
No. 4	75 – 100
No. 200	0 - 10

C. Imported sand shall have a sand equivalent of 30 per ASTM D 2419.

2.2 NATIVE EARTH BACKFILL

A. Native earth backfill used above the pipe zone shall be fine-grained materials free from roots, debris, and rocks larger than 3 inches.

2.3 WATER FOR COMPACTION

A. Water shall be free of organic materials injurious to the pipe coatings, have a pH of 7.0 to 9.3, maximum chloride concentration of 500 mg/l, and a maximum sulfate concentration of 500 mg/l.

PART 3 EXECUTION

3.1 GENERAL

A. Excavation, grading and compaction shall conform to the requirements of Section 19 of the State Standard Specifications.

3.2 INSPECTIONS

A. Verify stockpiled material has been approved for reuse.

B. Verify areas to be backfilled are free of debris, snow, ice, or water, and surfaces are not frozen.

3.3 PREPARATION

A. Identify required lines, levels, contours, and datum.

3.4 AC PAVEMENT AND CONCRETE REMOVAL

A. Cut bituminous and concrete pavements, regardless of the thickness, curbs, gutters and sidewalks prior to excavation of trenches.

1. Width of material removed shall be at least equal to the required width of the trench at ground surface.

2. Width of material removed shall be as shown on the Plans

3. AC pavement and concrete rubble shall not be used for trench backfill.

3.5 EXCAVATION

A. Excavate the trench to the lines and grades shown on the Drawings and details, with allowance for pipe thickness, sheeting and shoring if used, and for special bedding.

B. Paved Areas: Cut existing pavement to full depth to a true line before excavation and maintain the edge suitable for repaving. Pavement removed shall not be used as backfill.

A. Trenching Guidelines: Excavate the trench to the approximate level of the grade of the utility line to be installed, using adequate trench width and side slopes to safely accommodate worker access.

Unstable Trench Bottom: Secure approval of depth of over-excavation and stabilization method. For wet trench construction, use approved method of dewatering through diversion, damming and pumping, well points, or underdrain systems. Dispose of removed fluidized materials as approved. Use bedding material to build a suitable foundation to within 6 inches of finished utility grade, prior to bedding with the specified material. Compact layers to 95 percent of maximum density in not greater than 6-inch layers. Do not proceed with utility installation until wet trench and unstable conditions are corrected to the satisfaction of the Engineer.

B. Remove areas of sub-grade not readily capable of it-situ compaction.

1. Backfill with Bedding or Select Backfill material and compact to density equal to requirements for subsequent backfill.

C. Correct unauthorized excavation at no cost to Owner.

1. If the trench is excavated below the required grade, refill any part of the trench excavated below the grade.

2. Place the refilling material over the full width of trench in compacted layers not exceeding 8 inches deep to the established grade with allowance for special bedding.

D. Trench widths in the pipe zone shall be as shown on the drawings. If no details are shown, maximum width shall be 24 inches greater than the pipe outside diameter.

1. Trench width at the top of the trench will not be limited except where width of excavation would undercut adjacent structures and footings. In such case, width of trench shall be such that there is at least 2 feet between the top edge of the trench and the structure or footing.

E. Remove lumped soil.

F. Excavation shall not interfere with normal 45 degree bearing splay of foundations.

G. During trench excavation, place the excavated material only within the working area. Do not obstruct roadways or streets. Conform to federal, state, and local codes governing the safe loading of trenches with excavated material.

3.6 LENGTH OF OPEN TRENCH

A. Limit the length of open trench to or amount of pipe installed in one working day.

B. Complete backfilling, temporary or first layer paving, not more than 400 feet in the rear of pipelaying.

3.7 TRENCH EXCAVATION IN EMBANKMENT AREAS

A. Construct and compact the embankment to an elevation 1 foot, minimum, over the top of the largest pipe or conduit to be installed prior to trench excavation.

3.8 UNSUITABLE MATERIAL

A. Unsuitable material shall be excavated and disposed of in a lawful manner off the project site; all disposal shall be approved by the Engineer prior to initiating the work.

3.9 DEWATERING

A. The Contractor shall keep all excavation free from water. Furnish, install, maintain, and operate all necessary pumping and other equipment for dewatering of excavations. The Contractor shall at all times have on the project sufficient pumping equipment for immediate use, including stand-by pumps for use in case other pumps become inoperable.

B. The dewatering operation shall be continuous, so that the excavated areas are kept free from water during the construction, until backfill has been placed to a sufficient height to anchor the work against possible floatation.

C. Dewatering devices shall be adequately filtered to prevent the removal of fines from the soil.

D. Repair any damage caused by the failure of any part of the protective works. Remove temporary protective works when they are no longer needed for dewatering purposes.

E. Any drain rock required in the trench bottom to convey water or stabilize wet soil shall be included at no extra cost to the Owner.

F. Provision of dewatering and dewatering equipment shall be considered part of the project with no additional compensation allowed.

3.10 BACKFILLING

A. Support pipe during placement and compaction of bedding fill.

B. Backfilling and cleanup work shall be accomplished as sections of pipe or conduit are tested and approved. Vehicular travel through the work site shall be impeded or obstructed as little as possible.

A. Compaction: Use vibratory compactors for sands and gravels (non-cohesive soils). Use mechanical tampers for sand and gravel containing a significant portion of fine-grained materials, such as silt and clay (cohesive soils). Hand tamp around pipe or cable to protect the lines until adequate cushion is attained. Puddling or water flooding for consolidation of backfill or compaction by wheel rolling will not be permitted.

B. Employ a placement method that will not disturb or damage pipe or utilities.

C. Maintain optimum moisture content of backfill materials to attain required compaction density.

D. Compact trench backfill to the specified relative compaction. Compact by using mechanical compaction or hand tamping. Do not use high impact hammer type equipment except where the pipe manufacturer warrants in writing that such use will not damage the pipe.

E. Compact material placed within 12 inches of the outer surface of the pipe by hand tamping only.

1. Carefully place the material around the pipe so that the pipe barrel is completely supported and that no voids or uncompacted areas are left beneath the pipe.

2. Use particular care in placing material on the underside of the pipe to prevent lateral movement during subsequent backfilling.

F. After pipe has been bedded, place pipe zone material simultaneously on both sides of the pipe, in maximum 8-inch lifts, keeping the level of backfill the same on each side.

G. Do not use any axle-driven or tractor-drawn compaction equipment within 5 feet of building walls, foundations, and other structures.

H. Do not permit free fall of the material until at least 2 feet of cover is provided over the top of the pipe. Do not drop sharp, heavy pieces of material directly onto the pipe or the tamped material around the pipe. Do not operate heavy equipment over the pipe until at least 3 feet of backfill has been placed and compacted over the pipe.

I. Remove surplus backfill materials from site.

J. Leave stockpile areas completely free of excess fill materials.

3.11 COMPACTION REQUIREMENTS

A. Relative compaction requirements shall be as shown on the Plans:

END OF SECTION

SECTION 31 23 19

STRUCTURE EXCAVATION & BACKFILLING

PART 1 GENERAL

1.1 WORK INCLUDED

A. The work of this section consists of excavation and backfill for concrete structures, and preparation of subgrade for concrete flatwork.

B. Haul, place, rough grade, compact, and finish grade excavated material as engineered fill on those portions of the project site where it is necessary in order to construct the facilities indicated on the Plans.

C. Dispose of unsuitable material off-site or in designated areas, as directed by the Engineer.

1.2 RELATED WORK

A. Section 03 41 00 – Precast Concrete Structures

B. Section 31 23 16 – Trenching, Backfilling and Compacting

1.3 REFERENCES

A. ANSI/ASTM C136 – Sieve Analysis of Fine and Coarse Aggregates.

B. ANSI/ASTM D1557 – Moisture-Density Relations of Soils and Sol-Aggregate Mixture Using 10 lb (4.54 kg) Hammer and 18-inch (457 mm) Drop. (Curve)

C. ANSI/ASTM D1556 – Density of Soil and base rock in Place by Sand-Cone Method.

D. ASTM D 2937 – Density of soil and in place by Tube method.

E. Owners Standard Specifications for Earthwork

1.4 SAMPLES

A. Submit samples in accordance with the Standard General and Special Provisions.

1.5 SUBMITTALS

A. Submittals shall be in accordance with the Standard General and Special Provisions.

1.6 DEFINITION

A. Unsuitable Material: Unsuitable material is material determined to be:

1. Incapable of being compacted to specified density using ordinary methods at optimum moisture content.

2. Too wet to be properly compacted if circumstances prevent satisfactory in-place drying prior to incorporation into the work.

3. Otherwise unsuitable for the planned use.

1.7 PROTECTION

A. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavation.

B. Notify Engineer of unexpected subsurface conditions

C. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.

D. Grade excavation top perimeter to prevent surface water run-off into excavation.

1.8 CONTROL AND DIVERSION OF WATER

A. General – The Contractor shall furnish or procure all materials and labor required for constructing and maintaining all necessary cofferdams, channels, flumes, drains, sumps, and/or other temporary diversion and protective works and shall furnish, install, maintain, and operate all necessary pumping and other equipment for removal of water from the various parts of the work and for maintaining the foundations and other parts of the work free from water.

1.9 SITE CONDITIONS

A. Underground utilities may exist at this site. Contractor shall take all necessary precautions to protect said utilities. Notify Engineer of any deviation in utility location from that which is shown on the drawings. The site has been previously excavated to install the existing lift station and associated underground utilities as such, it is expected that most excavation will take place within a previously backfilled area. No geotechnical investigation or soils exploration has been performed for this project.

PART 2 PRODUCTS

2.1 SELECT BED AND FILL MATERIALS

A. Conform to Section 31 23 16, "Trenching, Backfilling and Compacting".

2.2 SELECT MATERIAL

A. Gravel: Pit run, natural stone; free of shale, clay, friable materials and debris; graded in accordance with 1½" x ¾" aggregate grading in Section 90-3, State Standard Specifications.

B. Pea Gravel: natural stone; washed, free of clay, shale, organic matter; ¼ inch minimum to ⅝ inch maximum size.

C. Sand: Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, and organic matter, graded in accordance with ANSI/ASTM C136 within the following limits:

Sieve Size	Percent Passing
No. 4	75-100
No. 200	0-10

D. Class 2 Aggregate Base: material as specified for ¾" maximum grading in Section 26, State Standard Specifications.

2.3 ENGINEERED FILL MATERIAL

A. Native granular soil materials may be used as engineered fill Particles larger than 3 inches shall be removed from trench backfill, particles larger than 6 inches shall be removed from engineered fill.

B. All imported fill material placed in structural areas shall consist of predominantly granular soil that is non-expansive, and shall be approved by the Engineer prior to use.

1. The R-value shall be at least 50.

2.4 GRANULAR BACKFILL/AGGREGATE BASE COURSE

A. Granular backfill and aggregate base course shall meet the requirements of State Standard Specifications, Section 26, Class 2 aggregate base, ¾ inch maximum.

B. Material from concrete crushing operations may be used as granular backfill provided it meets the above requirements.

2.5 WATER

A. Water development, hauling, and application shall be in accordance with Section 17, “Watering,” State Standard Specifications.

PART 3 EXECUTION

3.1 GENERAL

A. Provide required shoring, sheeting, and slope layback necessary to protect the excavation, as needed, for the safety of the employees and as required by applicable State and Federal laws. Provide suitable barricades for public safety, regardless of trench depth.

B. Upon completion of excavation and before placing forms or structures, notify the Engineer who will inspect the excavation and may take tests to determine soil-bearing values.

C. Identify required lines, levels, contours, and datum.

1. Stake and identify the extent of all earthwork operations prior to starting work.

D. Use suitable material removed from excavation before importing backfill.

E. Verify that stockpiled fill to be reused is approved by the Engineer.

F. Verify areas to be backfilled are free of debris, snow, ice, or water, and surfaces are not frozen.

3.2 DEWATERING

A. The Contractor shall keep all excavation free from water. Furnish, install, maintain, and operate all necessary pumping and other equipment for dewatering of excavations. The Contractor shall at all times have on the project sufficient pumping equipment for immediate use, including stand-by pumps for use in case other pumps become in-operable.

B. The dewatering operation shall be continuous, so that the excavated areas are kept free from water during the construction, until backfill has been placed to a sufficient height to anchor the work against possible floatation.

C. Dewatering devices shall be adequately filtered to prevent the removal of fines from the soil.

D. Repair any damage caused by the failure of any part of the protective works. Remove temporary protective works when they are no longer needed for dewatering purposes.

E. Provision of dewatering and dewatering equipment shall be considered part of the project with no additional compensation allowed.

F. Any drain rock required in the trench bottom to convey water or stabilize wet soil shall be included at no extra cost to the Owner.

3.3 EXCAVATION

A. Carefully excavate to the established lines and grades shown on the drawings, or as revised and approved by the engineer, to provide a firm, uniform, and unyielding foundation for the proposed structures.

B. Excavations for all footings, piers, finished walls and grade beams shall be sufficiently large so that forms for concrete may be properly placed, removed, and inspected.

1. Excavation for footings may be made to the net footing size plus 2 inches if the earth banks are sufficiently stable to remain in position until the concrete is in place and if approved by the Engineer.

C. The bottoms of footings, piers, slabs, walls, and grade beams to receive concrete shall be level before placing concrete. All foundations shall rest on firm bearing in undisturbed soil, or on controlled compacted fill.

1. The exposed subgrade surface shall be scarified to a depth of 8 inches, conditioned to optimum moisture content and compacted to at least 95 percent of the maximum dry density.

D. If any existing foundations, roots, stumps, debris, waste materials, pipes, or similar items have been removed, the Contractor shall excavate below these portions to solid undisturbed earth and foundations in these areas shall be built to necessary levels.

3.4 SURPLUS MATERIAL

A. Unless otherwise specified, surplus excavated material shall be used to widen embankments uniformly or to flatten slopes, or it shall be disposed of in a uniform manner along the adjacent roadway around the site or otherwise as approved.

B. Unless otherwise specified, surplus excavated material shall be used as fill for other areas requiring fill as shown on the Plans. Excess material that is not needed for engineered fill may be disposed of at an off-site spoil area. The location of the off-site spoil area, the limits of the fill area, the depths of fill, and the manner of work shall be as directed by the Engineer.

C. Stockpile surplus material as shown on the plans and/or as directed by the Engineer

D. Leave stockpile areas completely free of excess fill materials.

3.5 UNSUITABLE MATERIAL

A. Unsuitable material shall be excavated and disposed of in a uniform manner off the project site, within the Owner's property as approved, however all disposal shall be approved by the Engineer prior to initiating the work.

3.6 BACKFILLING

A. Unless otherwise shown in the Plans, all backfill shall conform to Section 19-3.06 of the State Standard Specifications.

B. Do not place backfill against concrete until concrete has cured sufficiently to accept the load as determined by Section 19-3.06 of the State Standard Specifications.

C. Place and compact common fill material in continuous layers not exceeding 8-inches loose depth.

D. Employ a placement method so not to disturb or damage pipes or utilities.

E. Maintain optimum moisture content of backfill materials to attain required compaction density.

F. Remove surplus materials from site.

3.7 TOLERANCES

A. Top Surface of Backfilling: Plus or minus 0.1 foot from design grade.

END OF SECTION

SECTION 32 11 23

AGGREGATE BASE

PART 1 GENERAL

1.1 WORK INCLUDED

A. Furnish, spread, and compact aggregate base in roadways, driveways and other paved areas as shown on the Plans.

B. The work of this section consists of furnishing and placing aggregate base material and/or lean concrete base materials, and filler if required, on the prepared subgrade.

1.2 RELATED WORK

A. Section 31 23 16 – Trenching, Backfilling and Compacting

B. Section 32 12 16 – Asphalt Concrete Paving

1.3 REFERENCES

A. Section 17 – Watering, State Standard Specifications.

B. Section 26 – Aggregate Bases, State Standard Specifications.

C. Section 28 - Lean Concrete Base, State Standard Specifications.

D. ANSI/ASTM C136 – Sieve Analysis of Fine and Coarse Aggregates.

E. ANSI/ASTM D1557 – Moisture-Density Relations of Soils and Soil-Aggregate Mixture Using 10 lb (4.54 kg) Hammer and 18-inch (457 mm) Drop.

F. ANSI/ASTM D1556 – Density of Soil and base rock in Place by Sand-Cone Method.

G. ASTM D 2922 and D – 3017 Density of soil and base rock in place by Nuclear method.

1.4 SUBMITTALS

A. Submittals shall be in accordance with the Standard General and Special Provisions.

B. If materials are obtained from a commercial source, submit certification from the supplier certifying that aggregate base course meets the requirements of this section.

C. Copies of certified weight tickets for each load of aggregate delivered to the project site.

1.5 QUALITY ASSURANCE

A. Tests for compaction shall conform to references listed in Part 1.3 of this section

B. Sample backfill materials per ASTM D 75.

C. Compaction testing will be performed in accordance with Section 19, & 25, State Standard Specifications.

1. Test every 300 lineal feet of engineered fill or aggregate base material placed. The Contractor shall not proceed with work over the area being tested until results have been verified by the Engineer. Immediately upon completion of each compaction test, a copy of the results shall be given by the testing laboratory to the Engineer.

D. The percentage composition by weight shall conform to Class 2 aggregate base determined by Test Method No. Calif. 202, modified by Test Method No. Calif. 905 if there is a difference in specific gravity of 0.2 or more between the coarse and fine portion of the aggregate or between blends of different aggregates.

E. Aggregate base shall also conform to the following quality requirements:

Tests	Test Method Calif. No
R-Value	301
Sand Equivalent	217
Durability Index	229

PART 2 PRODUCTS

2.1 MATERIALS

A. AGGREGATE BASE

1. Class 2 Aggregate Base, ¾-inch maximum; as per Section 26-1.02 A, State Standard Specifications.

2. Aggregate for Class 2 aggregate base shall be free from vegetable matter and other deleterious substances

B. LEAN CONCRETE BASE

1. Lean Concrete Base shall conform to Section 28 - Lean Concrete Base, State Standard Specifications.

C. WATER

1. As specified in State Standard Specifications.

2. At the time aggregate base is spread, it shall have a moisture content sufficient to obtain the require compaction. Such moisture shall be uniformly distributed throughout the materials.

PART 3 EXECUTION

3.1 SUBGRADE PREPARATION

A. As specified in Sections State Standard Specifications.

3.2 SPREADING

A. The aggregate base course material shall be deposited and spread to the required compacted thickness by means that will maintain the uniformity of the mixture. The aggregate base course shall be free from pockets of coarse or fine material.

B. Deliver aggregate base to the area to be paved as a uniform mixture and spread each layer in one operation.

C. Aggregate base placed at locations which are inaccessible to the spreading equipment shall be spread in two layers by any means to obtain the specified results.

D. The aggregate shall not be treated with lime, cement or other chemical materials before the Durability Index test has been performed.

E. The surface of the finished aggregate base at any point shall not vary more than 0.05-foot above or below the grade shown.

3.3 PLACING

A. If the required compacted depth of the aggregate base course exceeds 6 inches, place course in two or more layers of approximately equal thickness. The maximum compacted thickness of any one layer shall not exceed 6 inches.

3.4 MIXING

A. Mix the aggregate by any one of the three following methods.

1. Stationary Plant Method: Mix aggregate base course material and appropriate amount of water for compaction in an approved mixer. After mixing, transport aggregate to the job site while it contains the proper moisture content and place on the roadbed with an approved aggregate spreader. If necessary, before compaction, remove excess moisture by approved means.

2. Travel Plant Method: After the material for each layer has been placed through an aggregate spreader or windrow sizing device, it shall be uniformly mixed by a traveling mixing plant.

3. Road Mix Method: After placing each layer, mix materials at optimum moisture content using motor graders or other approved equipment until the moisture is uniform throughout.

B. When commercial binders or fillers are used with aggregate, mix with a central mixing plant of the twin-pugmill type. Other methods that ensure a thorough and homogenous mixture may be used on written approval from the Engineer.

3.5 MOISTURE CONTROL

A. When spread, aggregate base shall have a moisture content sufficient to obtain the specified compaction.

3.6 SURFACE FINISHING

A. Use a smooth steel wheel roller for the final rolling of top surface base course. Water surface and evenly spread loose stones before final rolling. Make minimum of two complete passes over area to embed stones. Correct soft spots developed during rolling.

B. Compacted aggregate base course surface shall be smooth and free from waves and other irregularities. Unsatisfactory portions of base course shall be corrected, at no additional expense to the Owner.

3.7 MATERIAL ACCEPTANCE REQUIREMENTS

A. Acceptance will be based on periodic samples and tests taken following mixing and before placing.

3.8 TOLERANCES

A. Surface: The finished surface of the base course will be tested with a 10-foot straightedge or other device. The variation between any two contacts with the surface shall not exceed 0.05 feet.

B. Width: Plan dimension, plus or minus 0.1 feet.

C. Thickness: Plan dimension, plus or minus 0.05 feet.

D. Any areas not complying with these tolerances shall be reworked to obtain conformity, at no additional expense to the Owner.

3.9 MAINTENANCE

A. Maintain base course in a satisfactory condition until surfaced or until final acceptance.

END OF SECTION

SECTION 32 12 16

ASPHALT CONCRETE PAVING

PART 1 GENERAL

1.1 WORK INCLUDED

A. The work of this section consists of constructing one or more surface courses composed of a mixture of aggregate, filler if required, asphalt material and placed on a prepared base to lines, grades and details, as shown on the plans and covered within these specifications. This section includes asphalt patching for areas where utility lines cross existing paved surfaces, trench resurfacing, saw cutting and resurfacing additional paving widths as required in the contract or under permit requirements.

B. Mix aggregate and asphalt binder at a central mixing plant. Haul, spread, and compact the mixture for paved areas as shown and as specified.

C. Upon completion of all paving, finish the entire roadway. Trim and shape cut and fill slopes to produce smooth surfaces and uniform cross sections. Clean the finished pavement of all dirt and foreign material.

D. Cross sections of paving shall be as indicated in the Plans.

1.2 RELATED WORK

A. Section 31 23 16 – Trenching, Backfilling and Compacting

1.3 REFERENCES

A. Section 22 - Finishing Roadway, State Standard Specifications.

B. Section 39 - Asphalt Concrete, State Standard Specifications.

C. Section 92 - Asphalts, State Standard Specifications

1.4 SUBMITTALS

A. Submittals shall be in accordance with the General and Special Provisions.

B. Certificates:

1. Certification from the supplier that the asphalt concrete is of correct type and meets requirements of this section.

2. Job mix formula shall be submitted with certification that the mix formula meets the requirements of Section 39 – Asphalt Concrete, State Standard Specifications. The job mix formula shall include definite single values for:

a. The percent of aggregate passing the specified sieve, based on dry weight of aggregate.

b. The percent of bituminous material to be added, based on the total weight of the mix.

c. Kind and amount of chemical additives (anti-stripping, hydrated lime, etc.) as established by the design procedure.

d. Maximum theoretical density.

e. Temperature ranges for the bituminous material at the point of mixing with the aggregates and bituminous mixture at the paving machine.

1.5 QUALITY ASSURANCE

A. Asphalt concrete supplier to prepare a mix design; to recommend adjustments to the proportions of the mix, as necessary, to conform to the mix design; and to consult with the Contractor and the Engineer during paving as required.

B. Density: Acceptable density of the in-place asphalt concrete pavement shall be 95 percent of the optimum values as determined from the mix design formula. Field sampling and density determination shall be made in accordance with AASHTO T230-68, or an accepted nuclear procedure.

PART 2 PRODUCTS

2.1 ASPHALTS

A. Asphalt binder to be mixed with aggregate shall be liquid asphalt PG 64-10, conforming to Section 92, "Asphalts", State Standard Specifications.

2.2 AGGREGATE

A. The combined aggregate grading of the asphalt concrete shall be Type B, 3/4-inch maximum, medium grading, per Section 39-2.02, State Standard Specifications.

B. The combined aggregate grading of the asphalt concrete shall be Type A, 3/4-inch maximum, course grading, per Section 39-2.02, State Standard Specifications.

2.3 TACK COAT

A. Tack coat shall conform with Section 94, Grade SS1h of the State Standard Specifications.

PART 3 EXECUTION

3.1 GENERAL

A. The pavement section shall comply with City of Los Banos Standards and as shown on the Plans.

B. Prior to any paving and surfacing operations, all pipes and conduits shall be installed and properly backfilled as shown.

3.2 STORAGE

A. Storage of materials shall conform to Sections 39-3.01 through 39-3.01C, State Standard Specifications.

3.3 MIXING

A. Mixing shall conform to the approved mix design.

B. The weight of asphalt binder to be mixed with aggregate shall be between 3 percent and 7 percent of the weight of the dry aggregate.

3.4 SUBGRADE

A. Subgrade shall conform to Section 39-4.01, State Standard Specifications.

B. Unless otherwise specified, the upper 6" of subgrade beneath the structural section shall be scarified, moisture conditioned as necessary and compacted to at least 95 percent relative density.

3.5 EQUIPMENT

A. Spreading and compacting equipment shall conform to Section 39-5, State Standard Specifications.

3.6 SPREADING AND COMPACTING

A. Spreading and compacting shall conform to Section 39-6, State Standard Specifications.

B. Apply mixture only during hours of daylight; when air temperature is 50 degrees F or higher; when surfaces to be paved are dry and free of frost, snow or ice; and when precipitation is not imminent.

3.7 PLACING TACK COAT

A. Apply tack coat on surfaces to receive finish pavement per Section 39 of the State Standard Specifications. Apply tack coat to metal or concrete surfaces that will be in contact with the asphalt concrete paving.

3.8 MISCELLANEOUS AREAS

A. Paving miscellaneous areas shall conform to Section 39-7.01, State Standard Specifications.

3.9 FINISHING PAVED AREAS

A. Finishing roadway and parking areas shall conform to the provisions of Section 22, State Standard Specifications.

3.10 TRENCH RESUFACING

A. At areas where asphalt concrete had been removed due to pipeline construction, trench shall be resurfaced with asphalt concrete. Unless otherwise noted, asphalt concrete resurfacing shall match the existing thickness of the asphalt and base course removed.

   1. Base course shall be as specified in Section 32 11 23 - Aggregate Base and in this Section.

B. If an edge of a trench resurfacing occurs within three (3) feet of an existing edge of pavement, lip of gutter or the face of curb, or if no gutter is present, the Contractor shall remove all existing paving to the lip of gutter or curb face and or, edge of existing pavement and resurface with the applicable trench resurfacing section. The limits of removal are minimum requirements and there may be additional width requirements by governing agencies.

C. If during the Contractor's operations pavement is disturbed outside the limits of removal, Contractor shall make the necessary repairs at no additional cost to the Owner.

D. Edge of existing asphalt along the trench line shall be tack coated prior to placing new asphalt concrete.

3.11 ACCEPTANCE REQUIREMENTS

A. Surface Tolerance: The variation between any two contacts with the surface shall not exceed 0.015 foot in 10 feet. Correct all humps or depressions exceeding the specified tolerance by removing defective work and replacing it with new material at no additional expense to the Owner.

B. A uniform compacted thickness shall be obtained for each course equal to or greater than the thickness shown. Individual tests shall not vary by more than plus or minus 0.02 foot.

C. Width: Plan dimension, plus or minus 0.02 foot.

D. Thickness: Plan dimension, plus or minus 0.02 foot.

END OF SECTION

SECTION 33 01 00

PIPE AND FITTINGS

PART 1 GENERAL

1.1 WORK INCLUDED

A. Furnish, install, and test all sewer force main, utility, pipe, fittings, and appurtenances as indicated and as specified.

1.2 RELATED WORK

A. Section 03 41 00 - Precast Concrete Structures

B. Section 31 23 16 – Trenching, Backfilling, and Compacting

1.3 REFERENCES

A. California Plumbing Code.

B. American Water Works Association Standards,

1.4 SUBMITTAL REQUIREMENTS

A. Submit shop drawings in accordance with the General and Special Provisions.

B. Submit manufacturer's catalog data. Show manufacturer's model number.

C. Submit dimensions including wall thickness and materials by reference standard and grade. Submit information on interior and exterior coatings as applicable.

1.5 QUALITY ASSURANCE

A. All work performed under this section shall meet all recommendations and requirements of AWWA, Uniform Plumbing Code (UPC), NFPA 24, ASTM D2774, and all other applicable national, state, local, standards and regulations.

1.6 MATERIALS

A. All bolts, nuts, washers, and tie rods used to secure underground fittings shall be stainless steel per ASTM A320 unless noted otherwise.

1. Apply an anti-seize compound to all threads of stainless steel bolts.

PART 2 PRODUCTS

2.1 DUCTILE IRON PIPE

A. General: Ductile iron pipe shall conform to ANSI A21.51 (AWWA C151), and shall be Class 52 unless shown otherwise. Pipe for grooved or flanged joints shall be no less than Class 53.

B. Joints:

1. Buried pipe and pipe fittings shall have push-on joints or mechanical joints conforming to AWWA C111. Flanged joints, sleeve-type mechanical couplings, and grooved-type couplings shall be used when shown.

2. For push-on joints, shape of pipe ends shall conform to ANSI A21.11 (AWWA C111). Gaskets and lubricant for pipe and fittings shall conform to ANSI A21.11 (AWWA C111).

3. For mechanical joints, dimensional and material requirements for pipe ends, glands, bolts, nuts, and gaskets shall conform to ANSI A 21.11 (AWWA C111). Pipe smaller than 4 inches shall have screwed or grooved joints

4. For flanged joints, ends of pipe and fittings shall be provided with flanges conforming to ANSI A21.15 (AWWA C115), and to ANSI B16.5 for 150 lb. class. Bolts, nuts, and gaskets for flanged connections shall conform to ANSI B18.2.1. For grooved joints, groove specifications shall conform to ANSI/AWWA C606.

C. Fittings: Fittings with push-on, mechanical joint, grooved joints and flanged ends shall conform to ANSI A21.53 (AWWA C153). Fittings shall have pressure rating of 350 psi for 3”-24” and 250 psi rating for 30”-48” pipe. Fittings shall have cement-mortar lining equivalent to that of the pipe lining.

D. Coating and Lining: Pipe shall be bituminous seal-coated and cement-mortar lined. The lining shall conform to AWWA C104.

E. All buried ductile iron pipe shall be encased in an 8 mil lining of polyethylene, installed per AWWA C105.

2.2 POLYVINYL CHLORIDE SCHEDULE PIPE

A. General: PVC schedule pipe up to 4 inches in diameter shall be ASTM D1785, Schedule 40 and 80 as specified or indicated in the Plans. Pipe material shall have cell classification 12454-B and have NSF seal.

B. Joints: Joints shall be solvent weld joints between pipes, and flanged or threaded at valves or fittings. Flange diameter and drilling shall conform to ANSI B16.5, class 150.

C. Solvent cement for joints shall conform to ASTM D2564 and primer shall conform to ASTM F656. Fittings: PVC fittings shall conform to ASTM D2466, all classifications 12454-B, bearing NSF seal.

2.3 GROOVED COUPLINGS

A. Groove dimensions shall conform to AWWA C606.

B. Grooved couplings for ductile iron shall be Victaulic Style 31;

C. Flexible grooved couplings for steel pipe shall be Victaulic Style 77 or equal; rigid grooved couplings for steel pipe shall be Victaulic Style 07 or equal. Couplings shall be rigid unless otherwise noted on the drawings.

D. Grooved - Flanged adapters shall be Victaulic Style 341 for ductile iron pipe and Style 741 for steel pipe or equal.

E. Grooved coupling for high density polyethylene pipe shall be Victaulic Style 995 or 997 or equal.

2.4 FLANGED JOINTS

A. Flange shall conform to ANSI B16.5, Class 150.

B. All steel hardware installed underground shall be coated with a rust preventative, wrapped with 4 mil polyethylene sheeting, and secured with PVC tape.

C. Gaskets shall meet the pressure requirements of the adjoining flanges and shall conform to AWWA C-207. Gaskets for flat faced flanges shall be 1/8-inch thick.

D. Gaskets for metallic pipe and non-potable 150 psi or less services shall be acrylic or aramid fiber bound with nitrile; Garlock Blue-Gard 3000 or equal. EPDM rubber gaskets, Garlock 98206 or equal, are also acceptable.

E. Gaskets for metallic pipe and potable water service shall be NSF/ANSI-61 certified EPDM rubber, Garlock 98206 or equal.

F. Gaskets for non-metalic flat faced flanges shall be constructed of a fluoroelastomeric material with a hardness of 70 durometer designed specifically for lower seating stress. Gaskets shall be certified to NSF/ANSI-61 for potable water service. Gaskets shall be Garlock Stye XP or equal.

2.5 FLEXIBLE SLEEVE COUPLINGS

A. Flexible sleeve couplings shall be one of the following, or Engineer approved equivalent:

1. Dresser, Inc., Style 38 for Steel Pipe, and Style 253 Wide- Range for Steel, PVC, Copper, and Cast/Ductile Iron pipe.

2. Smith Blair, Inc., Series 411 or Wide-Range 461

3. Romac Industries, Inc., Style 400 for 12” and larger pipe or XR501 Extended Range Coupling, 4” thru 12” pipe size.

B. Center sleeves shall comply with the following

Nominal Pipe Diameter	Minimum Sleeve Length
6 inch and smaller	Manufacturer’s Standard
8 through 14 inch	7 inch
14 inch and larger	10 inch

2.6 FLEXIBLE SPOOL-TYPE EXPANSION COUPLINGS

A. Flexible rubber coupling shall be flexible joints, which includes a tube, body cover and flanges. The tube shall be a leak proof liner and the body shall consist of fabric and rubber compound, reinforced with steel wire or rings for strength. Flexible rubber coupling shall be either a single arch or double arch construction as indicated in the Plans. Couplings shall have control rods to limit extension and flanges shall have backing rings. Couplings used for services with pressures greater than 75 psi shall have stainless steel flanges – rubber flanges with backing rings shall not be acceptable. Flexible couplings shall have minimum pressure ratings of 100 psi; couplings installed on suction of pumps shall have a minimum vacuum (pressure) rating of 30 inches Hg column.

1. Flexible coupling shall have Buna N liner and cover and shall be manufactured by Proco, Red Valve Company Inc., Metraflex Company or equal.

2.7 MARKER TAPE FOR BURIED PIPING

See Section 33 05 26 Utility Line Marking.

2.8 TRACER WIRE

Not used

2.9 FASTENERS

A. All fasteners shall include washers under both bolt head and nut unless the use of washers is incompatible with the fitting design.

B. Unless otherwise noted, all bolts, tie rods, and T-bolts used to secure flanges, fittings, and couplings located underground or submerged in liquid shall be Type 304 or 316 stainless steel per ASTM A320 or ASTM A193. Nuts shall be 304 or 316 stainless steel per ASTM A 194 and washers shall be ASTM F436 Type 3.

C. Unless otherwise noted, all bolts, tie rods, and T-bolts used to secure flanges, fittings, and couplings located indoors, above grade, and in vaults shall be carbon steel conforming to ASTM A307, Grade B with ASTM A563A nuts and ASTM F436 washers. Bolts, nuts, and washers shall be hot dipped galvanized in accordance with ASTM F2329. Stainless steel meeting the requirements of Paragraph B shall also be acceptable.

PART 3 EXECUTION

3.1 HANDLING AND DISTRIBUTION OF MATERIALS

A. Delivery: Handle pipe carefully to ensure delivery at the project site in sound, undamaged condition. Contractor shall replace damaged pipe at no additional expense to the Owner.

B. Storage: Do not store materials directly on the ground. Support piping to prevent warping. Use protective covers where pipe may be damaged by sunlight.

C. No more than one week's supply of material shall be distributed in advance of pipe laying operations, unless otherwise approved or required.

D. Before laying, pipe shall be inspected for cracked, broken, or defective pieces. Such pieces shall be rejected. Pipe shall be carefully lowered into the trench to prevent damage. All dirt or other foreign matter shall be removed from inside the pipe before lowering into the trench.

3.2 INSTALLATION OF BURIED PRESSURE PIPING

A. General: Pipe, fittings, and appurtenances shall be installed in accordance with the manufacturer's instructions and in accordance with the following references:

1. Ductile Iron Pipe - AWWA C600

B. Handling: The pipe shall be protected to prevent entrance of foreign materials during laying operations. When laying is not in progress, open pipe ends shall be protected with a watertight plug or other approved means to exclude water or foreign material.

C. Alignment:

1. Mains shall be installed to the grades and elevations indicated and shall have a minimum cover of 30-inches from the top of the pipe to existing ground or paved surface unless otherwise indicated.

2. The allowable angle of deflection at any joint shall not exceed the amount recommended by the pipe manufacturer for the particular pipe size used. Deviation of any pipe section from the line and grade indicated shall not exceed 1/2-inch.

D. Joints:

1. Pipe shall be assembled and joined in accordance with the manufacturer's published instructions for the type of pipe and joint used. All portions of the joints shall be thoroughly cleaned before the sections of pipe are assembled. The ends of each pipe shall abut against the next pipe section in such a manner that there shall be no unevenness of any kind along the bottom half of the interior of the pipe. Where mechanical joints are used, the pipe shall be marked in such a manner that it can be determined after installation that the pipe is properly seated.

2. Where flexible couplings are used as expansion joints, the ends of the pipes shall be separated 1-inch to allow for expansion. The welded seam at the end of each coupled steel pipe shall be ground smooth for approximately 12-inches. Couplings shall be centered on pipe ends. Runs of pipe

containing flexible couplings shall be properly blocked, anchored or tied to the structure to prevent joints from separating.

3. Mechanical restrained joints shall be installed in accordance with joint manufacturer's instructions and recommendation.

E. Installation of Marker Tape: Install tape in backfill directly over each pipeline, 12 inches over top of pipe, unless shown otherwise on the Plans. Where utilities are buried in a common trench, identify each line by a separate marker tape. Place tapes directly over the applicable line.

3.3 INSTALLATION OF EXPOSED PIPING

A. General - Pipe shall be installed as specified, as indicated on the Plans or, in the absence of detail piping arrangement, in a manner acceptable to the Engineer.

B. Pipe shall be cut from measurements taken at the site and not from the Plans. All necessary provisions shall be taken in laying out piping to provide throughout for expansion and contraction. Piping shall not obstruct openings or passageways. Pipes shall be held free of contact with building construction so as not to transmit noise resulting from expansion.

C. The inside of all pipe, valves, and fittings shall be smooth, clean, and free from blisters, loose mill scale, sand, dirt, and other foreign matter when erected. The interior of all lines shall be thoroughly cleaned, to the satisfaction of the Engineer, before being placed in service.

D. Stuffing box leakage from water sealed pumps shall be contained and not allowed to into storm drains.

E. In all piping except air piping, insulating fittings shall be provided to prevent contact of dissimilar metals.

F. Pipe Joints - Pipe joints shall be carefully and neatly made in accordance with the requirements that follow.

1. Flanged - Flange bolts shall be tightened sufficiently to slightly compress the gasket and effect a seal, but not so tight as to fracture or distort the flanges. A plain washer shall be installed under the head and nut of bolts connecting plastic pipe flanges. Anti-seize thread lubricant shall be applied to the threaded portion of all stainless steel bolts during assembly. Connecting flanges shall have similar facings, i.e., flat or raised face.

3.4 ACCEPTANCE TESTS FOR BURIED PRESSURE PIPING

A. General.

1. All testing and inspection shall be performed after final backfill and compaction operations are complete. If the Contractor so desires, he may

pretest the lines at his own expense, but final testing must be performed after compaction requirements have been approved.

B. In general, tests shall be conducted in accordance with AWWA C600 and C651 except as otherwise herein specified.

C. All newly installed sections of buried pressure piping shall be pressure and leakage tested as described herein.

1. For buried pressure pipelines, tests shall be made on two or more valved sections not to exceed 2,500 feet in length. The Contractor shall furnish all necessary equipment, material and labor required.

2. Tests shall be made after the trench has been backfilled and compacted, but not until at least 5 days have elapsed since any thrust blocks in the section have been poured.

3. The pipe shall be filled with water and all air expelled from section being tested. A test pressure equal to 1.5 times the design pressure, of the pipe measured at the point of lowest elevation pressure, or 100 psi, whichever is greater, shall be applied.

4. The test pressure in the line shall be maintained for a period of 2 hours. Test pressure shall be maintained within 5 psi during the test period by adding water as required. The water required to maintain test pressure shall be measured by means of a graduated barrel, drum, or similar device at the pump suction or through a meter.

Allowable leakage at the specified test pressure shall not exceed the amounts allowed by AWWA C600, $L = \frac{SD\sqrt{P}}{148{,}000}$

Where:

L = Testing allowance in gallon per hour.
S = Length of pipe tested in feet.
D = Nominal diameter of the pipe in inches.
P = Average test pressure during the hydrostatic test, in pounds per sq. inch.

Hydrostatic testing allowance per 1,000 ft. of pipeline in gph.

PSI	4”	6”	8”	10”	12”	14”	16”	18”	20”	24”
200	0.38	0.57	0.76	0.96	1.15	1.34	1.53	1.72	1.91	2.29
175	0.36	0.54	0.72	0.89	1.07	1.25	1.43	1.61	1.79	2.15
150	0.33	0.50	0.66	0.83	0.99	1.16	1.32	1.49	1.66	1.99
125	0.30	0.45	0.60	0.76	0.91	1.06	1.21	1.36	1.51	1.81
100	0.27	0.41	0.54	0.68	0.81	0.95	1.08	1.22	1.35	1.62

5. Should testing disclose any visible leaks or leakage greater than that allowed, the defective joints or pipe shall be located, repaired, and re-tested until satisfactory. The cost of any retests, including time for the Engineer, shall be borne by the Contractor at no additional cost to the project.

3.5 ACCEPTANCE TEST FOR EXPOSED PIPING

A. Pipe to be Tested - All new installed piping sections shall be pressure and leakage tested as specified herein.

B. Pressure Testing - After the section of line to be tested has been filled with water or other test media, the test pressure shall be applied and maintained without interruption for 2 hours plus any additional time required for the Engineer to examine all piping undergoing the test and for the Contractor to locate all defective joints and materials.

1. Test medium shall be potable water for potable water piping; all other piping may be tested using plant water subject to Engineer’s approval.

2. Pipe system shall be tested at1-1/2 times the operating pressure, or 100 psi, whichever is greater, using the appropriate test fluid medium.

3. All piping shall be tight and free from leaks. All pipe, fittings, valves, pipe joints, and other materials that are found to be defective shall be removed and repaired or replaced with new and acceptable material, and the affected portion of the piping be retested until satisfactory. The cost of any retests, including time for the Engineer, shall be borne by the Contractor at no additional cost to the project.

Compressed air or gas under pressure shall not be used to test plastic piping unless specifically recommended by the pipe manufacturer.

Leakage may be determined by loss of pressure, soap solution, chemical indicator, or other positive and accurate method acceptable to the Engineer. All fixtures, devices, or other accessories which are to be connected to the lines and which would be damaged if subjected to the specified test pressure shall be disconnected and ends of the branch lines plugged or capped as required during the testing procedures.

END OF SECTION

SECTION 33 01 31

SEWER BYPASS

PART 1 GENERAL

1.1 SUMMARY

A. The work of this section consists of bypass pumping and spill prevention.

1.2 SUBMITTALS

A. As specified in the General and Special Provisions.

B. Submit the following:

1. List of equipment for bypass pumping.

2. Bypass pumping plan.

3. Spill Prevention and Response Plan (SPRP)

1.3 SPILL PREVENTION AND RESPONSE PLAN IMPLEMENTATION

A. Contractor shall assess the pipeline segment for spill potential and analyze spill flow paths. The spill potential assessment shall also include the potential spillage of flushed materials and water that are present in the bypass pipe during removal. A site-specific SPRP shall be developed and mitigation measures installed to include sand bags and liners, plugging culverts, mobilizing bypass equipment, and other spill prevention and response measures, equipment, and materials, as required, prior to proceeding with the work. The site-specific SPRP development and implementation shall be approved by the City prior to proceeding with the work. The SPRP will be submitted in accordance with the General and Special Provisions.

B. The primary purpose of the SPRP is to prevent sewage spills from occurring by proper planning and protection of the project area, and then to respond to any sewage spills that may occur during the course of this project including appropriate notification of staff. The SPRP (prepared and implemented by the Contractor) will be general in nature and typical to all phases of the work with site specific plans required for areas involving trenching or any work with the possibility of accessing the existing system. The Contractor shall exercise diligence and care in work near any sewer facilitates. Any fines incurred by the City due to the acts of the Contractor shall be paid by the Contractor.

C. The SPRP shall be structured in two parts – first a Spill Prevention Plan and then a Spill Response Plan. The Spill Prevention Plan (SPP) shall include evaluation of specific conditions, set-up of containment for actual construction work as well as for bypass pumping. Sewer bypass must be constructed to tie existing gravity sewer lines into the existing force main. The Spill Response Plan (SRP) shall include the initial response to stop and contain a spill, notification of staff, clean-up, and follow-up documentation. The SPP and the SRP together comprise the entire SPRP. A template of a SPRP follows in Appendix A at the end of this Section. An electronic version of this template will be provided to the successful bidder.

D. All Contractor employees are required to be trained in the Spill Prevention Control in accordance with this SPRP.

E. Equipment and materials shall be available as identified in the site-specific SPRP. Equipment and material shall be standing by and ready immediately in the event of a spill.

PART 2 PRODUCTS

2.1 BYPASS PUMP ASSEMBLY

A. Contractor shall maintain a minimum of two bypass pump assemblies at the site in sound operating condition. Bypass pumps and equipment shall be mobilized to the work location and ready to operate prior to commencement of work.

B. Each bypass pump assembly shall include, but is not limited to, the pump, engine drive, starters, battery starter, valving, suction hose and appurtenances, such that the equipment is fully functional and equipped for use as a bypass pump station. Muffler shall be hospital grade with regard to noise suppression. Equipment shall meet air quality exhaust criteria of the local Air Pollution Control District as applicable.

C. The Contractor shall assess the work and develop a list of bypass equipment required for approval by the City. The Contractor shall assume that all pipes flow at capacity for development of the equipment list. The Contractor shall also assume that sewer service shall not be interrupted and that continuous monitoring of all bypass operation and equipment is required. A peak sanitary sewer flow rate of approximately 314 gallons per minute is expected at the site

D. A sample list of minimum materials and equipment to be provided are listed below. This sample list is provided as an example only, actual materials and equipment must be determined by the contractor.

(1 ea) Pumps, trailer-mounted, with built-in 30-gallon gas tank.

(1 ea) Backup/Redundant Pumps, trailer-mounted, with built-in gas tank.

(5 ea) Four-inch cam lock male x 4-inch cam lock female, 20-foot all-weather semiflexible suction hoses.

(2 ea) Portable Spill Guards, 12’ x 15’ x 0.5’ for trailer-mounted pumps to sit while in operation.

(100 ft) Hard tubing for use in running across roadways with blocking and sandbags to secure against traffic loads.

PART 3 EXECUTION

3.1 FLOW CONTROL

A. Divert sewage flows around the lift station reconstruction area. Furnish, install, and operate pumps, plugs, conduits, and other equipment to divert the flow of sewage around the lift station rehabilitation area in which work is to be performed. Plugs shall be designed so that all or any portion of the sewage can be released. The plug shall be provided with a tag line. The pumping system shall be of sufficient capacity to handle existing flow, plus additional flow that may occur during a rainstorm. Pumping will be required on a 24-hour basis and engines shall be equipped in a manner to keep noise to a minimum. Contractor shall have personnel available 24 hours a day on an on-call basis, with a response time of 30 minutes, to make repairs to bypass equipment if needed while the bypass is in service.

B. Standby pumps shall be provided. Pumping shall be done in such a manner as will not damage property or create a nuisance or health menace. After the work has been completed, flow shall be restored to normal.

APPENDIX A

SPILL PREVENTION ANALYSIS FORM

SPILL PREVENTION ANALYSIS – For Sewer Bypass

Superintendent: _______________________ Date: ______________

Foreman_______________________ Page _______of_______

Location of Pipe Segment (attach appropriate map):

Need for Spill Containment System (Y/N): If No, briefly explain why _______________
____

STEP BY STEP PLAN TO IMPLEMENT OPERATION:

1. Install bypass pipeline and pumping if required	**5.**
2. Maintain pipeline and pumps	**6.**
3. Remove bypass and pumps	**7.**
4.	**8.**

POTENTIAL SPILL HAZARDS	
1. Leaks at points of connection	**6.**
2. Damage to bypass line	**7.**
3. Sabotage	**8.**
4. Drain and cleaning spills	**9.**
5. Pumping operations	**10.**

Potential Spill Hazard #	**Precautionary Plan**
1. Leaks at points of connection	**Close valves each side of station, contain leak and repair or replace defects**
	Fix leak and/or replace system component
	Report to Superintendent
	Bypass outage cannot last longer than 2 hours during peak flows.

Potential Spill Hazard #	Precautionary Plan
2 Damage bypass line	Close valves each side of damaged pipe
	Contain leak and install repair coupling immediately.
	Keep an inventory of spare parts
	Report to Superintendent

Potential Spill Hazard #	Precautionary Plan
3. Sabotage	Close valves on each side of damaged pipe.
	Contain leak and install repair coupling immediately.
	Keep inventory of spare parts.
	Report to Superintendent.

Potential Spill Hazard #	Precautionary Plan
4. Draining and Cleaning spills	Return flow to installed force main pipe
	Flush, sanitize and drain bypass pipe
	Use containment when removing drain and ARV stations
	Use containment when cutting pipe for removal

Potential Spill Hazard #	Precautionary Plan
5. Pumping Operation	Provide backup power (emergency generator or redundant gas or diesel engine driven pumps) and redundant pumping.

SECTION 33 01 36

SEWER RECONSTRUCTION

PART 1 GENERAL

1.1 WORK INCLUDED

A. Construct new sewer force main and appurtenances along or adjacent to existing pipeline alignments, as shown on the plans.

B. Modify existing sewer wet well to allow changes in sewer grades and profiles.

C. Furnish temporary by-passes as required to maintain existing flows until after completion of lift station reconstruction.

1.2 ORDER OF WORK

A. Contractor shall maintain existing flows to the pump station until the new Pump Station has been completed and tested.

B. Contractor shall schedule sewer reconstruction to minimize the time during which pumped by-passes are required.

C. Contractor shall submit a schedule for the individual portions of sewer construction work.

1.3 RELATED WORK

A. Section 03 36 00 – Concrete Lining for Corrosion Protection

B. Section 03 41 00 – Precast Concrete Structures

C. Section 31 23 16 – Trenching, Backfilling and Compacting

D. Section 33 01 00 – Pipe and Fittings

E. Section 33 01 31 Sewer Bypass

1.4 REFERENCES

A. Section 70, Miscellaneous Facilities, State Standards

PART 2 PRODUCTS

2.1 MATERIALS

A. Pipe shall conform to Section 33 01 00 – Pipe and Fittings.

PART 3 EXECUTION

3.1 PREPARATION

A. Contractor shall submit a plan of work and schedule for each reach of sewer reconstruction prior to beginning work.

B. Contractor shall notify Owner prior to beginning construction or by-pass operations.

3.2 WET WELL MODIFICATION

A. Wet well shall be modified in accordance with details shown on the Plans.

B. Before modification of the wet well, the new pumping bypass assembly and vault shall be completed and tested.

3.3 SEWER BY-PASS

A. See section 33 01 31 Sewer Bypass

3.4 REPLACEMENT FORCE MAIN

A. Replacement force main involves the removal or abandonment of existing force main and replacing with new force main, pumping bypass vault, valve assemblies and vault as indicated in the Plans.

END OF SECTION

SECTION 33 05 26

UTILITY LINE MARKING

PART 1 GENERAL

1.1 WORK INCLUDED

A. The work of this section consists of furnishing and installing utility line marking.

1.2 SUBMITTALS

A. Submittals shall be in accordance with the Standard General and Special Provisions.

B. Samples: 24-inch strips of tape and 2 markers.

C. Certification that the materials used in the tape fabrication meet the requirements of this section.

PART 2 PRODUCTS

2.1 MARKING TAPE

A. Capable of being inductively detected electronically.

B. Construction: Metallic foil laminated between two layers of impervious plastic film not less than 3 inches wide. Total thickness of tape shall not be less than 0.005 inch (5 mil) plus or minus 10 percent manufacturing tolerances.

1. Film: Inert plastic. Each film layer shall be not less than 0.001 inch thick (1.0 mil).

2. Foil: Not less than 0.001 inch thick (1.0 mil).

3. Adhesive: Compatible with foil and film.

C. Imprint: 3/4-inch or larger bold black letters.

D. Legend: Identify buried utility line tape with imprint such as "Caution: Sewer Line Below". Repeat identification at approximately 24 inch intervals.

E. Background Color: APWA color code and as specified below:

Color	Utility
Safety Brown	Force Mains and Effluent Lines

F. Manufacturer: Lineguard, Inc., Wheaton, Illinois; Reef Industries, Inc., Houston, Texas; Thor Enterprises, Inc., Sun Prairie, Wisconsin; or Engineer approved equivalent.

PART 3 EXECUTION

3.1 MARKING TAPE

A. Install tape in backfill directly over each buried utility line as shown on the detailed drawings.

B. Where utilities are buried in a common trench, identify each line by a separate warning tape. Bury tapes side by side directly over the applicable line.

3.2 TRACER WIRE

A. Wherever PVC or Polyethylene pipe is installed in the ground, a tracer wire shall be installed. Conductors shall be spliced in accordance with Division 26 - Electrical.

1. Tracer wire shall be brought to the surface at all valves, air valves, blow-offs, Fire Hydrants Water Services and other pipeline appurtenances

B. Tracer Wire: Attachment of the wire to the pipe shall be made with plastic tie-wraps or other approved method.

C. Contractor shall conduct a satisfactory continuity test prior to Owner acceptance.

END OF SECTION

SECTION 40 05 23

VALVES AND APPURTENANCES

PART 1 GENERAL

1.1 WORK INCLUDED

A. Furnish, install, and test all valves, fittings, and appurtenances as indicated and as specified and as shown on the plans.

1.2 RELATED WORK

A. Section 03 41 00 – Precast Concrete Structures

1.3 REFERENCES

A. California Plumbing Code.

B. American Water Works Association Standards.

C. Section 90, "Portland Cement Concrete", State Standard Specifications.

1.4 SUBMITTALS

A. Submittals shall be in accordance with the Standard General and Special Provisions.

B. Shop drawings, manufacturer's literature, and guarantees.

PART 2 PRODUCTS

2.1 VALVES

A. Gate valves shall be resilient wedge gate valves shall conform to AWWA C509 and be in compliance with the Improvement Standards of the City of Los Banos.

1. The valves shall be designed for a water working pressure of 250 psi. All working parts shall be constructed of brass, stainless steel, or other corrosion-resistant materials.

B. Eccentric plug valves shall be DeZurick Model 118 Victaulic Model 365, with manual actuators, or Engineer approved equivalent. Plug valves shall be provided with lever operators.

C. Check valves for wastewater piping shall be of the unobstructed waterway, quick closing, spring-loaded, swing type with iron body, flanged ends, and bronze trim. Hinge pins shall be stainless steel with both ends extending through bronze-bushed bearings and outside stuffing boxes with grease lubricated packing or O-ring seals. Equal end size check valves shall be American Valve & Hydrant "52SC", Dresser "M&H Style 259-02", or Mueller "A2600-6-02", or Engineer approved equivalent.

2.2 VALVE ACTUATORS

A. Wrench Nuts - Wrench nuts shall be provided on all buried valves and where indicated on the Plans. Unless otherwise directed by the Owner, all wrench nuts shall comply with Section 3.16 of AWWA C500. Not less than two operating keys shall be furnished for operation of the wrench nut operated valves.

B. Lever Actuators - Lever actuators shall be designed to produce the specified torque with a maximum pull of 80 pounds.

2.3 APPURTENENCES

A. Flanges shall be flat faced with ANSI B16.1, Class 150 diameter and drilling.

B. Where indicated on the Plans, valves shall include valve extension stems to extending to subgrade, terminating with 2 inch AWWA operating nut.

C. Valve box and cover shall be traffic rated assembly (minimum of AASHTO H-20 rating).

PART 3 EXECUTION

3.1 VALVES

A. Each valve assembly shall be installed complete with appurtenant piping and valves as specified or indicated on the Plans.

B. Valves shall be installed in accordance with the manufacturers' instructions and recommendations.

C. Unless otherwise necessary for proper operation or as permitted by the Engineer, all eccentric plug valves shall be installed with the shaft horizontal and the plug in the upper half of the valve body. Valves shall be installed with the seat on the upstream end.

3.2 VALVE BOX

A. Valve box shall be adjusted to final pavement grade and installed in accordance with Owner's Standard Specifications.

END OF SECTION

SECTION 40 50 00

INSTRUMENTATION AND CONTROLS – GENERAL PROVISIONS

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. The Contractor shall procure the services of a single Process Control System Supplier (PCSS) to furnish and install all materials, equipment, labor and services, except for those services and materials specifically noted, required to achieve a fully integrated and operational system as specified herein and in other Specification Sections listed below.

B. Requirements specified in this Section apply to all equipment specified in the above sections, unless otherwise specified. The work shall include furnishing, installing and testing the equipment and materials detailed in the Section 40 51 50, Control Panels and Panel Mounted Equipment:

C. Auxiliary and accessory devices necessary for system operation or performance, such as transducers, relays, signal amplifiers, intrinsic safety barriers, signal isolators, software, and drivers to interface with existing equipment or equipment provided by others under other Sections of these specifications, shall be included whether they are shown on the Drawings or not.

D. Substitutions on functions or type of equipment specified shall not be acceptable unless specifically noted. In order to confirm compatibility between all equipment, coordinate all interface requirements with mechanical and electrical systems and furnish any signal isolation devices that might be required.

E. Equipment shall be fabricated, assembled, installed and placed in operating condition in full conformity with the project Specifications, Drawings, engineering data, instructions, and recommendations of the equipment manufacturer as approved by the Engineer.

F. To facilitate the Owner's future operation and maintenance, similar products (e.g., differential pressure transmitters) shall be supplied from the same manufacturer.

G. All equipment and installations shall satisfy applicable Federal, State and local codes.

H. Use the equipment, instrument, and loop numbering scheme that has been developed and shown on the Drawings and specifications in the development of the submittals. Do not deviate from or modify said numbering scheme without the Engineer's approval.

1.2 RELATED WORK

A. Process Flow Diagrams (PFD) are included in the Drawings.

B. Control System Architecture Block Diagram is included in the Drawings.

C. Specific control system and instrumentation materials and requirements are included in related Sections of Division 40.

D. Instrumentation and Controls conduit systems are specified in Section 26 05 33.

1.3 SUBMITTALS

A. General submittal requirements include:

1. Refer to General and Special Provisions for general submittal requirements.

2. Other Division 40 Sections may have additional submittal requirements.

3. Shop drawings shall be submitted as detailed herein. Shop drawings shall demonstrate that the equipment and services to be furnished comply with the provisions of these specifications and shall provide a complete record of the equipment as manufactured and delivered.

4. Submittals shall be complete; giving equipment specifications, details of connections, wiring, ranges, installation requirements, and specific dimensions. Submittals consisting of only general sales literature shall not be acceptable.

5. Submittals shall be bound in separate three-ring binders, with an index and sectional dividers, with all drawings reduced to a maximum size of 11-inch by 17-inch, then folded to 8.5 inch by 11 inch for inclusion within the binder. Maximum binder size shall be 3 inches.

6. The submittal drawings' title block shall include, as a minimum, the PCSS registered business name and address, Owner and project name, drawing name, revision level, and personnel responsible for the content of the drawing.

7. Incomplete or partial submittals not complying with the submittal arrangements outlined in this Section will be returned without review.

8. Separate submittals shall be made as follows:

   a. Project Plan, Deviation List and Schedule Submittal

   b. Application Development System Submittal

   c. Coordination Meetings Agenda

   d. I/O List Submittal

   e. Field Instrument Submittal

   f. Hardware Submittal and Software Packages Submittal

   g. Panel Layout Drawings and Wiring Diagram Submittal

h. Testing Plans Submittal

i. Spares, Expendables, and Test Equipment Submittal

j. Final System Documentation

B. Project Plan, Deviation List, and Schedule Submittal

1. Submit a Project Plan within 21 calendar days from Notice to Proceed date. The Project Plan shall, as a minimum, contain the following:

a. Overview of the proposed control system in clear text format describing the PCSS understanding of the project work, preliminary system architecture drawing, interfaces to other systems, schedule, startup, and coordination.

b. Approach to work in clearly written format describing how the PCSS intends to execute the work. A discussion of switchover, startup, replacement of existing equipment with new, and other tasks as required by these specifications shall be included as applicable.

c. Preliminary HMI software, PLC software, and PLC hardware submittal information, including version numbers, solely to determine compliance with the requirements of the Contract Documents prior to development of system programming. Review and approval of software and hardware systems as part of this Project Plan stage shall not relieve the PCSS of meeting all the functional and performance requirements of the system as specified herein. Substitution of manufacturer or model of these systems after the submittal is approved is not allowed without Engineer approval.

d. Project personnel and organization including the PCSS project manager, project engineer, and lead project technicians. Include resumes of each key individual and specify in writing their commitment to this project.

e. Preliminary coordination meeting agendas as specified herein.

f. Preliminary testing plan

g. Preliminary training plan

h. Sample formats of the shop drawings to be submitted and in conformance with the requirements of the Specifications. At a minimum include samples of panel fabrication drawings, loop, I/O wiring diagrams, and graphical display presentations.

2. Exceptions to the Specifications or Drawings shall be clearly defined in a separate Deviation List. The Deviation List shall consist of a paragraph by paragraph review of the Specifications indicating acceptance or any proposed deviations, the reason for exception, the exact nature of the exception and the proposed substitution so that an evaluation may be made

by the Engineer. The acceptability of any device or methodology submitted as an "or equal' or "exception" to the specifications shall be at the sole discretion of the Engineer. If no exceptions are taken to the specifications or drawings the PCSS shall make a statement as such. If there is no statement by the PCSS, then it is acknowledged that no exceptions are taken.

C. Input/Output (I/O) Address List Submittal

1. Submit a complete system Input/Output (I/O) address list for equipment connected to the control system under this Contract.

2. I/O list shall be based on the P&ID's, the Drawings, the design I/O list (if included within these specifications), and requirements outlined in the Specifications.

3. The I/O list shall be submitted in both a Microsoft Excel readable electronic file format on a CD-ROM and an 8-1/2 inch by 11-inch hard copy.

4. The I/O list shall reflect all active and spare I/O points. Add points to accommodate spare I/O.

5. The I/O list shall be arranged such that each control panel has a dedicated worksheet. At a minimum, I/O worksheet tables shall include the following information:

a. TAG NUMBER(S): The identifier assigned to a device that performs a function in the control system. As part of this information, the loop number of the tag shall be broken out to allow for sorting by loop.

b. DESCRIPTION: A description of the function of the device (text that includes signal source, control function, etc.) Include the text "Spare Points" for all I/O module points that are not connected to equipment.

c. PHYSICAL LOCATION: The Control Panel designation of where the I/O point is wired to.

d. PHYSICAL POINT ADDRESS: Rack, Slot, and Point (or Channel) assignment for each I/O point.

e. LOGICAL POINT ADDRESS: If the PCSS is performing the PLC programming, I/O address of each point. If the PCSS is not performing the PLC programming, then leave this field blank for use by the PFSS.

f. I/O TYPE: use DO - Discrete Output, DI - Discrete Input, AO - Analog Output, AI - Analog Input, PI - Pulse Input, or PO – Pulse Output.

g. RANGE/STATE: The range in engineering units corresponding to an analog 4-20 mA signal, or, the state at which the value of the discrete points are "1."

h. ENGINEERING UNITS: The engineering units associated with the Analog I/O.

i. ALARM LIMITS: Include alarm limits based on the control descriptions and the Drawings.

6. The I/O list shall be sorted in order by:

a. Physical location

b. I/O Type

c. Loop Number

d. Device Tag

7. After the I/O list is approved, do not modify the PLC I/O addresses without approval by the Engineer.

8. Where multiple mechanical components are provided for process redundancy, their field connections to I/O modules shall be arranged such that the failure of a single I/O module will not disable all mechanical components of the redundant system. This applies to all I/O types.

D. Field Instruments Submittal

1. Submit complete documentation of all field instruments using ISA-S20 data sheet formats. Submit a complete Bill of Materials (BOM) or Index that lists all instrumentation equipment ordered by the loop numbering system as shown in the Contract Documents.

2. Submit separate data sheets for each instrument including:

a. Plant Equipment Number and ISA tag number per the drawings

b. Product (item) name used herein and on the Contract Drawings

c. Manufacturer's complete model number

d. Location of the device

e. Input / output characteristics

f. Range, size, and graduations in engineering units.

g. Physical size with dimensions, enclosure NEMA classification and mounting details in sufficient detail to determine compliance with the requirements of the Contract Documents.

h. Materials of construction for enclosure and wetted parts.

i. Instrument or control device sizing calculations where applicable.

j. Certified calibration data for all flow metering devices.

k. Two-wire or four-wire device type as applicable.

3. Submit index and data sheets in electronic format as well as hard copies on 8-1/2 by 11 inches formats. Electronic format shall be in Microsoft Excel or Word. Submit electronic copy on CD-ROM or DVD disk.

E. Hardware Submittal and Software Packages Submittal

1. For each hardware component indicated below, submit a cover page that lists, at a minimum, date, specification number, product name, manufacturer, model number, Location(s), and power required. Preferred format for the cover page is ISA S20, general data sheet; however, other formats will be acceptable provided they contain all required information.

2. Catalog cuts for supplied Programmable Logic Controller (PLC), process controller equipment, remote telemetry units (RTU), including central processing units, redundancy units, memory, input modules, output modules, modems, network interface modules, mounting racks, and power supplies. Submit descriptive literature for each hardware component that fully describes the units being provided. Any deviation of the hardware systems from the preliminary hardware submittal included in the Process Plan or Applications Development System submittal shall be described in detail.

3. Complete system architecture diagram showing in schematic form, the interconnections between major hardware components including control centers, panels, power supplies, consoles, computer and peripheral devices, networking equipment, processors, I/O modules, local operator interfaces, and like equipment. The system architecture shall be complete and shall depict all required cables, media type between components, network protocol used at each network level, details on connection requirements such as cable pin- outs, port numbers, and rack slot numbers. The intent of this specification requirement is for the PCSS to develop a diagram that is complete in every aspect to allow purchase of all required equipment by part number, and to allow a qualified technician to interconnect all equipment without having to refer to additional manuals or literature. Minimum sheet size shall be 11"x17" and using a larger sheet size or more than one sheet is acceptable.

4. Submit details of the controller development software package, the local operator graphic panel development software package, and the HMI software application packages to be used for each piece of equipment. Indicate all standard and optional features provided. Confirm in the submittal that the licenses will be assigned to the Owner at the time of purchase. Any deviation of the software platforms from the preliminary software submittal included in the Project Plan shall be described in detail.

F. Panel Layout Drawings and Wiring Diagrams Submittal

1. Where direct hardwired interfaces exist between the PCSS control panels and vendor provided control panels furnished under other Divisions, the Contractor shall provide to the PCSS the approved shop drawings and submittals in order for the PCSS to provide complete wiring diagrams showing all wiring connections in the I/O system. This includes but is not limited to terminal block numbering, relay contact information, instruments, equipment, and control panel names. These drawings will be included in the Final Documentation submittal. Leaving this information blank on the Final Documentation drawings is not acceptable.

2. Panel Layout Drawings: Drawings shall be furnished for all panels, consoles, and equipment enclosures specified. Panel assembly and elevation drawings shall be drawn to scale and detail all equipment in or on the panel. Panel drawings shall be 11"x17" minimum in size. As a minimum, the panel drawings shall include the following:

    a. Interior and exterior panel elevation drawings to scale.

    b. Nameplate schedule.

    c. Conduit access locations.

    d. Panel construction details.

    e. Cabinet assembly and layout drawings to scale. The assembly drawing shall include a bill of material on the drawing with each panel component clearly defined. The bill of material shall be cross-referenced to the assembly drawing so that a non-technical person can readily identify any component of the assembly by manufacturer and model number.

    f. Fabrication and painting specifications including color (or color samples).

    g. Submit construction details, NEMA ratings, intrinsically safe barrier information, gas sealing recommendations, purging system details, etc. for panels located in hazardous locations or interfacing to equipment located in hazardous areas.

    h. Heating and cooling calculations for each panel supplied indicating conformance with cooling requirements of the supplied equipment and environmental conditions. Calculations shall include the recommended type of equipment required for both heating and cooling.

    i. Submit evidence that all control panels shall be constructed in conformance with UL 508 and bear the UL seal confirming the construction. Specify if UL compliance and seal application shall be accomplished at the fabrication location or by field inspection by UL inspectors. All costs associated with obtaining the UL seal and any inspections shall be borne by the Contractor and included in the Project Bid Price.

3. Panel Wiring Diagrams: Panel wiring diagrams depicting wiring within and on the panel as well as connections to external devices. If ISA Loop Wiring Diagrams are specified below, equipment external to the control panel and related external connections do not need to be shown on the Panel Wiring Diagrams. Panel wiring diagrams shall include power and signal connections, UPS and normal power sources, all panel ancillary equipment, protective devices, wiring and wire numbers, and terminal blocks and numbering. Field device wiring shall include the device ISA-tag and a unique numeric identifier. The diagrams shall identify all device terminal points that the system connects to, including terminal points where I/O wiring lands on equipment not supplied by the PCSS. Wiring labeling used on the drawings shall match that shown on the Contract Documents or as developed by the PCSS and approved by the Engineer. I/O wiring shall be numbered with rack number, slot number, and point number. Two-wire and four-wire equipment shall be clearly identified and power sources noted. Submit final wire numbering scheme. Panel drawings shall be 11" x17" minimum in size.

4. ISA Loop Wiring Diagrams: Detailed ISA loop wiring diagrams showing requirements for each loop which is shown on the contract drawings. The Loop Drawings shall be prepared in accordance with ISA Standard S5.4 latest edition with the layout following Figures 5 and 6 (shown in the S5.4 Standard), titled Minimum Required Items Plus Optional items". Loop drawings shall be 11"x17" minimum in size. The information required on the Loop Drawings in order to satisfy the "minimum" and "optional" requirements is as follows:

   a. Minimum Required Items – The following information shall be provided on Loop Drawings in order to meet this requirement:

      1) Identification of the loop and loop components shown on the P&IDs. Other principal components of the loop to be shown and identified under ISA-5.1, "Instrumentation Symbols and Identification".

      2) Word description of loop functions within the title. If not adequate, use a supplemental note. Identify any special features or functions of shutdown and safety circuits.

      3) Indication of the interrelation to other instrumentation loops, including overrides, interlocks, cascaded set points, shutdowns and safety circuits.

      4) All point-to-point interconnections with identifying numbers or colors of electrical cables, conductors, pneumatic multitubes, and individual pneumatic and hydraulic tubing. This identification of interconnections includes junction boxes, terminals, bulkheads, ports, and grounding connections.

5) General location of devices such as field, panel, auxiliary equipment, rack, termination cabinet, cable spreading room, I/O cabinet, etc.

6) Energy sources of devices, such as electrical power, air supply, and hydraulic fluid supply. Identify voltage, pressure, and other applicable requirements. For electrical sources, identify circuit or disconnect numbers.

7) Process lines and equipment sufficient to describe the process side of the loop and provide clarity of control action. Include what is being measured and what is being controlled.

8) Actions or fail-safe positions (electronic, pneumatic, or both) of control devices such as controllers, switches, control valves, solenoid valves, and transmitters (if reverse- acting). These are to be identified in accordance with ISA-5.1, "Instrumentation Symbols and Identification".

b. Additional Required Items – The following information shall be provided on Loop Drawings (in a tabular format as shown in Figures 5 and 6 of ISA 5.4) in order to meet this requirement:

1) Process equipment, lines, and their identification numbers, source, designation, or flow direction.

2) Reference to supplementary records and drawings, such as installation details, P&IDs, location drawings, wiring diagrams or drawings, and instrument specifications.

3) Specific location of each device, such as elevation, area, panel subdivision, rack or cabinet number and location, I/O location.

4) Cross reference between loops that share a common discrete component, such as multipen recorders, dual indicators, etc.

5) References to equipment descriptions, manufacturers, model numbers, hardware types, specifications or data sheets, purchase order numbers.

6) Signal ranges and calibration information, including setpoint values for switches, and alarm and shutdown devices.

7) Software reference numbers, such as I/O addresses, control block types and names, network interfaces, point names.

8) Engraving or legend information that helps identify the instrument or accessory. Per ISA-5.4-1991 11.

9) Accessories, tagged or otherwise identified, such as regulators, filters, purge meters, manifold valves, root valves.

10) References to manufacturer's documentation such as schematics, connection details, operating instructions.

11) Color code identification for conductors or tubes that use numbers for differentiation.

G. Testing Plan Submittals

1. Test Procedure Submittals: Submit the procedures proposed to be followed for each test. Procedures shall include test descriptions, forms, and checklists to be used to control and document the required tests. Include sign-off forms for each testing phase or loop with sign-off areas for the PCSS, Engineer, and Owner.

2. Test Documentation: Upon completion of each required test, document the test by submitting a copy of the signed off test procedures. Testing shall not be considered complete until the signed-off test procedures have been submitted and favorably reviewed. Submittal of other test documentation, including "highlighted" wiring diagrams with field technician notes, are not acceptable substitutes for the formal test documentation.

3. Each loop shall have a Loop Status signoff form to organize and track its inspection, adjustment and calibration. These forms shall include the following information and check-off items:

    a. Project Name.

    b. Loop Number.

    c. Detailed test procedure indicating exactly how the loop will be tested including all required test equipment, necessary terminal block numbers, and simulation techniques required.

    d. Tag Number for each component.

    e. Check-offs/signoffs for each component.

        1) Tag/identification
        2) Installation
        3) Termination - wiring
        4) Termination - tubing
        5) Calibration/adjustment

    f. Check-offs/signoffs for the loop.

        1) Panel interface terminations
        2) I/O interface terminations
        3) I/O signal operation
        4) Inputs/outputs operational: received/sent, processed, adjusted
        5) Total loop operation
        6) Space for comments.
        7) Sign off and date fields for the Contractor, the Engineer, and the PCSS.

4. Each active analog subsystem element shall have a Component Calibration form. These forms shall have the following information including space for data entry:

   a. Project Name.

   b. Loop Number.

   c. ISA Tag Number and I/O Module Address.

   d. Manufacturer.

   e. Model Number/Serial Number.

   f. Summary of Functional Requirements. For example:

      1) For Indicators: Scale ranges
      2) For Transmitters/Converters: Scale and chart ranges
      3) For Computing Elements: Function
      4) For Controllers: Action (direct/reverse) control modes (PID)
      5) For Switching Elements: Unit range, differential (FIXED/ADJUSTABLE), reset (AUTO/MANUAL)
      6) For I/O Modules: Input or output

   g. Calibrations; for example:

      1) For Analog Devices: Required and actual inputs and outputs at 0, 50 and 100 percent of span.
      2) For Discrete Devices: Required and actual trip points and reset points.
      3) For Controllers: Mode settings (PID).
      4) For I/O Modules: Required and actual inputs or outputs for 0, 50 and 100 percent of span.

   h. Space for comments.

   i. Sign off and date fields for the Contractor, the Engineer, and the PCSS.

H. Spares, Expendables, and Test Equipment Lists Submittal

1. This submittal shall include for each Subsystem:

   a. A list of, and descriptive literature for, spares, expendables, and test equipment as specified in Division 40.

   b. A list of, and descriptive literature for, additional spares, expendables, and test equipment recommended by the manufacturer.

c. Unit and total costs for the additional spare items specified or recommended for each subsystem.

I. Final System Documentation

1. The Final System Documentation shall consist of operations and maintenance manuals as specified herein. The manuals shall be bound in three-ring binders, maximum size of three inches, with Drawings reduced to 11 inch by 17 inch, then folded to 8.5 inch by 11 inch for inclusion. Each section shall have a uniquely numbered tab divider, and each component within each section shall have a separate binder tab divider.

2. The operations and maintenance manuals shall, at a minimum, contain the following information:

a. Table of Contents

1) A Table of Contents shall be provided for the entire manual with the specific contents of each volume clearly listed. The complete Table of Contents shall appear in each volume.

b. Instrument and Equipment Lists

1) The following lists shall be developed in Excel and provided not only as a hardcopy in O&M but also electronically on a CD.

2) An instrument list for all devices supplied including tag number, description, specification section and paragraph number, manufacturer, model number, serial number, range, span, location, manufacturer phone number, local supplier name, local supplier phone number, completion year replacement cost, and any other pertinent data.

3) An equipment list for all non-instrument devices supplied listing description, specification section and paragraph number, manufacturer, model number, serial number, location, manufacturer phone number, local supplier name, local supplier phone number, completion year replacement cost, and any other pertinent data.

c. Data Sheets with Vendor Operations and Maintenance Information

1) ISA S20 data sheets shall be provided for all field instruments.

2) Cover page for each device, piece of equipment, and OEM software that lists, at a minimum, date, specification number, product name, manufacturer, model number, Location(s), and power required. Preferred format for the cover page is ISA S20, general data sheet; however, other formats will be acceptable provided they contain all required information.

3) Final vendor O&M documentation for each device, piece of equipment, or OEM software shall be either new documentation written specifically for this project, or modified

standard vendor documentation. All standard vendor documentation furnished shall have all portions that apply clearly indicated with arrows or circles. All portions that do not apply shall be neatly lined out or crossed out. Groups of pages that do not apply at all to the specific model supplied shall be removed.

4) For any component requiring dip switch settings or custom software configuration, that information shall be included along with the corresponding data sheets and O&M information.

d. As-Built Drawings

1) Complete as-built drawings, including all drawings and diagram specified in this section under the "Submittals" section. These drawings shall include all termination points on all equipment the system in connected to, including terminal points of equipment not supplied by the PCSS.

2) As built documentation shall include information from submittals, as described in this Specification, updated to reflect the as-built system. Any errors in or modifications to the system resulting from the Factory and/or Functional Acceptance Tests shall be incorporated in this documentation.

e. Original Licensed Software

1) Submit original software diskettes or CD-ROMs of all software provided under this Contract. Submit original paper based and electronic documentation for all software provided. Submit license agreement information including serial numbers, license agreements, User Registration Numbers and related information. All software provided under this Contract shall be licensed to the Owner at the time of purchase. Provide media in software sleeves within O&M manual.

f. Electronic O&M Information

1) In addition to the hard copy of O&M data, provide an electronic version of all equipment manuals CDROM or DVD. Electronic documents shall be supplied in Adobe Acrobat format.

2) Provide electronic files for all custom-developed manuals. Text shall be supplied in both Microsoft Office format and Adobe Acrobat format.

3) Provide electronic files for all drawings produced. Drawings shall be in AutoCAD ".dwg" format and in Adobe Acrobat format. Drawings shall be provided using the AutoCAD eTransmit feature to bind external references, pen/line styles, and fonts into individual zip files along with the drawing file.

4) Each computer system hardware device shall be backed up onto CDROM or DVD after Substantial Completion and shall be turned over to the Owner.

3. The cover and edge of each volume shall contain the following information:

   a. Project Name (refer to Contract Documents)

   b. Contract Number (refer to Contract Documents)

   c. Instrumentation and Control System Hardware[or Applications Engineering] Operations and Maintenance Manual

   d. Specification Sections [List appropriate section]

   e. Subcontractor Name

   f. Date

   g. Volume X of Y [Where X is the volume number and Y is the number of volumes]

1.4 REFERENCE STANDARDS

A. Publications are referred to in the text by basic designation only. Where a date is given for reference standards, that edition shall be used. Where no date is given for reference standards, the latest edition in effect at the time of bid opening shall apply.

B. International Society of Automation (formerly the Instrumentation, Systems and Automation Society) (ISA)

   1. ISA S5.2 Binary Logic Diagrams for Process Operations

   2. ISA S5.3 Graphic Symbols for Distributed Control/Shared Display Instrumentation Logic and Computer Systems.

   3. ISA S5.4, Instrument Loop Diagrams

   4. ISA S20, Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves.

   5. ISA RP60.3, Human Engineering for Control Centers

   6. ISA RP60.6, Nameplates, Labels, and Tags for Control Centers

C. National Electrical Manufacturers Association (NEMA)

D. National Fire Protection Agency (NFPA)

   1. NFPA 70, National Electrical Code (NEC)

E. Underwriters Laboratories, Inc. (UL)

   1. UL 508 – Industrial Control Equipment

F. American Society for Testing and Materials (ASTM)

1. ASTM A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

1.5 QUALITY ASSURANCE

A. The Process Control System Supplier (PCSS) shall be a "systems integrator" regularly engaged in the design and the installation of instrumentation systems and their associated subsystems as they are applied to the municipal water and wastewater industry. For the purposes of this Specification Section, a "systems integrator" shall be interpreted to mean an organization that complies with all of the following criteria:

1. Employs personnel on this project who have successfully completed ISA or manufacturers training courses on general process instrumentation and configuration and implementation of the specific programmable controllers, computers, and software proposed for this project. The Company shall be a member of Control System Integrators Association Certified (CSIA) and key personnel shall hold ISA CCST Level 1 certification or have a minimum of 10 years of verifiable plant startup experience. Key personnel shall include, as a minimum, the lead field technician.

2. Has successfully completed work of similar or greater complexity on at least three previous projects within the last five years. Successful completion shall be defined as a finished project completed on time, without any outstanding claims or litigation involving the PCSS. Potential references shall be for projects where the PCSS's contract was of similar size to this project.

B. The PCSS shall maintain a permanent, fully staffed and equipped service facility within 250 miles of the project site with full time employees capable of designing, fabricating, installing, calibrating, and testing the systems specified herein. At a minimum, the PCSS shall be capable of responding to on-site problems within 12 hours of notice. Provide an on-site response within 4 hours of notification starting at two months before scheduled startup to two months after startup completion.

C. PCSS shall hold a valid UL-508 certification for their panel fabrication facility.

D. Actual installation of the instrumentation system need not be performed by the PCSS's employees; however, the PCSS as a minimum shall be responsible for the technical supervision of the installation by providing on site supervision to the installers of the various components.

E. Only approved suppliers will be accepted. The Contractor must name the proposed system supplier per General and Special Provisions.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be in accordance with General and Special Provisions.

B. Shipping Precautions

1. After completion of shop assembly, factory test and approval of all equipment, cabinets, panels and consoles shall be packed in protective crates and enclosed in heavy duty (5 mil) polyethylene envelopes or secured sheeting to provide protection from damage, dust and moisture. Dehumidifiers shall be placed inside the polyethylene coverings. The equipment shall then be skid-mounted for final transport. Lifting rings shall be provided for moving without removing protective covering. Boxed weights shall be shown on shipping tags together with instructions for unloading, transporting, storing and handling at the job site.

2. Manufacturer's special instructions for field handling, storage and installation required for protection, shall be securely attached to the packaging for each piece of equipment prior to shipment. The instructions shall be stored in resealable plastic bags or other means of protection.

3. If any apparatus has been damaged, such damage shall be repaired at no additional cost to the owner.

1.7 NOMENCLATURE AND IDENTIFICATION

A. Field Instrument Tags

1. A permanent stainless steel or other non-corrosive material tag firmly attached and permanently and indelibly marked with the instrument tag number, as indicated in the Drawings, shall be provided on each piece of equipment supplied under this Section. Equipment shall be tagged before shipping to the site.

2. Provide 1/8-in by 3/8-in, Type 316 stainless steel button head machine screws.

3. All supplied field instrument transmitters and field instrument transmitter elements shall have a stainless steel identification tag attached to each transmitter and element prior to shipment. Tag shall be attached via stainless steel chain or stainless steel wire (24 gauge inches. Tag shall include the ISA alphanumeric instrument number as indicated in the P&ID, loop, and detail drawings. The alphanumeric instrument number shall be stamped into the tag and shall have a minimum of 3/16-in high alphanumeric characters.

B. Panel Nameplates

1. See Section 40 51 50.

1.8 WARRANTY

A. Provide warranty per General and Special Provisions and as specified herein.

1.9 PROJECT/SITE REQUIREMENTS

A. Environmental Requirements. Refer to Section 26 05 00 and the Electrical Drawings for specific environmental and hazardous area classifications.

B. Elevation: Equipment shall be designed to operate at the project ground elevation.

C. Temperature:

1. Outdoor areas' equipment shall operate [between - 30 to 50 C degrees ambient].

2. Equipment located in indoor locations shall operate between [10 to 35 C] degrees ambient minimum.

3. Storage temperatures shall range from [0 to 50 C] degrees ambient minimum.

4. Additional cooling or heating shall be furnished if required by the equipment as specified herein.

D. Relative Humidity: Air conditioned area equipment shall operate between 20 to 95 percent relative, non-condensing humidity. All other equipment shall operate between 0 to 100 percent relative, condensing humidity.

PART 2 PRODUCTS

2.1 PRODUCTS GENERAL

A. All instrumentation and electronic equipment shall be of the manufacturer's latest design, utilizing printed circuitry and epoxy or equal coating to prevent contamination by dust, moisture and fungus. The field mounted equipment and system components shall be designed for installation in dusty, humid and slightly corrosive service conditions.

B. All instruments shall be provided with mounting hardware and floor stands, wall brackets, or instrument racks unless otherwise noted. Fasteners for securing control panels and enclosures to walls and floors shall be either hot-dipped galvanized after fabrication or stainless steel. Provide stainless steel fasteners only in corrosive areas rated NEMA 4X on the Drawings or as defined under Division 26. Provide and size anchors in accordance with CBC per seismic calculations. Provide minimum size anchor of 3/8-inch.

C. All indicators shall be linear in process units, unless otherwise noted. All transmitters shall be provided with indicators in process units, accurate to two percent or better.

D. All equipment, cabinets and devices furnished shall be heavy-duty type, designed for continuous industrial service. The system shall contain similar products of a single manufacturer, and shall consist of equipment models, which are currently in production. All equipment provided shall be of modular construction and shall be capable of field expansion.

E. All electronic/digital equipment shall be provided with radio frequency interference protection.

F. Electrical

1. Equipment shall operate on a 60 Hertz alternating current power source at a nominal 120 volts, plus or minus 10 percent, except where specifically noted. Regulators and power supplies required for compliance with the above shall be provided between power supply and interconnected instrument loop. Where equipment requires voltage regulation, constant voltage transformers shall be supplied.

2. With the exception for field device network connected devices, all electronic instrumentation shall utilize linear transmission signals of isolated 4 to 20 mA DC (milliampere direct current) capable of driving a load up to 750 ohms, unless specified otherwise. However, signals between instruments within the same panel or cabinet may be 1-5 VDC (volts direct current).

3. 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. No zero based signals will be allowed.

4. All switches shall have double-pole double-throw contacts rated at a minimum of 600 VA, unless noted otherwise.

5. Switches and/or signals indicating an alarm, failure or upset condition shall be wired fail-safe to the Dialer system. A fail-safe condition is an open circuit when in an alarm state.

6. Materials and equipment shall be UL approved. Where components are not available with UL approval, integrate the device with ground fault protective devices, isolation transformers, fuses, or other protective equipment necessary to achieve compliance with UL 508 requirements.

7. All equipment furnished shall be designed and constructed so that in the event of power interruption, the systems specified herein shall go through an orderly shutdown with no loss of memory, and shall resume normal operation without manual resetting when power is restored, unless otherwise noted.

8. All transmitter output signals shall include signal and power source isolation.

2.2 ELECTRICAL SURGE PROTECTION

A. General - Surge protection shall be provided to protect the electronic instrumentation system from induced surges propagating along the signal and power supply lines from lightning, utility, or the plant electrical system. The protection systems shall be such that the protective level shall not interfere with normal operation, but shall be lower than the instrument surge withstand level. Protection shall be maintenance free and self-restoring. Devices shall have a response time of less than 50 nanoseconds and be capable of handling a discharge surge current (at an 8x20μs impulse waveform) of at least 8 kA. Ground wires for all instrumentation device surge protectors shall be connected to a low resistance ground in accordance with Section 26 05 00.

B. Provide protection of all analog signal (4-20 mA) circuits where any part of the circuit is outside of the building envelope. Circuits shall be protected at both the transmitter and the control system end of the circuit. Protection devices located near the transmitter shall be mounted in a separate enclosure, unless conduit mounted, and shall be Phoenix Contact PT Series, MTL Surge Technologies (Telematic) TP48, Citel TSP-10 series, or equal. Substitution of a single device to protect both 120 VAC and 4-20 mA wires to an instrument is acceptable. Protection devices in control panels shall be MTL Surge Technologies (Telematic) SD Series, Phoenix Contact PT Series, Citel BP1-24, or equal.

C. Provide protection of all 120 VAC power feeds into control panels, instruments, and control room equipment. Surge arresters shall be Transtector ACP-100BW Series, Phoenix Contact "Mains-PlugTrab", MCG Surge Protection 400 Series, or equal.

D. Inductive Loads – At a minimum, provide coil surge suppression devices, such as varistors or interposing relays, on all process controller outputs or switches rated 120 VA or less that drive solenoid, coil, or motor loads.

2.3 TUBING AND FITTINGS

A. All instrument air header takeoffs and branch connections less than 2-in shall be 316 stainless steel.

B. All instrument shut-off valves and associated fittings shall be supplied in accordance with the piping specifications and all instrument installation details. The materials for fittings and valves shall be compatible with process fluids. Where metallic fittings and valves are compatible, wetted materials shall be Type 316 stainless steel.

C. The materials for instrument tubing shall be compatible with process fluids. Where metallic tubing is compatible, tubing shall be fully annealed ASTM A269 Seamless 316 grade free of OD scratches having the following dimensional characteristics as required to fit the specific installation:

1. 1/4-in to 1/2-in O.D. by 0.035 wall thickness
2. 5/8-in to 1-in O.D. by 0.049 wall thickness
3. 1-in O.D. by 0.065 wall thickness
4. 1-1/4-in O.D. by 0.065 wall thickness
5. 1-1/2-in O.D. by 0.083 wall thickness
6. 2-in O.D. by 0.095 wall thickness

D. All process connections to instruments shall be annealed 1/2-inches O.D. stainless steel tubing, Type 316.

E. All tube tracks shall be supported by stainless steel and installed as per manufacturer's installation instructions.

2.4 SPARE PARTS

A. Spare parts of the type and quantity as recommended by the manufacturer shall be furnished for all devices furnished under these sections.

B. All spare parts shall be wrapped in bubble wrap, sealed in a polyethylene bag complete with dehumidifier, then packed in cartons and labeled with indelible markings. Complete ordering information including manufacturer's part number, part ordering information including manufacturer, part number, part name, and equipment name and number(s) for which the part is to be used shall be supplied with the required spare parts. The spare parts shall be delivered and stored in a location directed by the Engineer.

C. As a minimum, furnish the following spare parts for control panels:

1. Timers - Five of each type installed
2. Relays - Five of each type installed
3. Fuses and circuit breakers - 10% (minimum of 10 fuses and 2 circuit breakers) of each type and size installed
4. Light bulbs - 10% (minimum of 10) of each type installed
5. Power supplies - one of each type installed.
6. Manufacturer's cables - one of each type installed.
7. Selector switches/pushbuttons - Two of each type installed including 5 contact blocks.
8. Surge protection devices - One of each type installed.
9. Provide one quart of touch-up paint, for each type and color used for all RTU cabinets, panels, and consoles supplied.

D. The following field Instrument related Spare Parts shall be furnished:

1. Miscellaneous: One year supply of items recommended by the manufacturer of the equipment including all reagents, dissolved oxygen probes, batteries, and calibration standards as needed to operate and maintain the furnished equipment.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION

A. Instrumentation and accessory equipment shall be installed in accordance with the manufacturer's instructions. The locations of equipment, transmitters, alarms and similar devices indicated are approximate only. Exact locations of all devices shall be as approved by the Engineer during construction. Obtain in the field, all information relevant to the placing of process control equipment and in case of any interference with other work, proceed as directed by the Contractor and furnish all labor and materials necessary to complete the work in an approved manner at no additional cost to the Owner.

B. All equipment used in areas designated as hazardous shall be designed for the Class, Group and Division as required for the locations as shown on the Drawings and specified in Division 26. All work shall be in strict accordance with codes and local rulings.

C. Unless specifically indicated, direct reading or electrical transmitting instrumentation shall not be mounted on process piping. Instrumentation shall be mounted on instrument racks or stands. All instrumentation connections shall be provided with shutoff and drain valves. For differential pressure transmitters, 5-valve manifolds for calibration, testing and blow down service shall also be provided. For chemical or corrosive fluids, diaphragm seals with flushing connections shall be provided.

D. All piping and tubing to and from field instrumentation shall be provided with necessary unions, calibrations and test tees, couplings, adaptors, and shut-off valves. Process tubing shall be installed to slope from the instrument toward process for gas measurement service and from the process toward the instrument for liquid measurement service. Provide drain/vent valves or fittings at any process tubing points where the required slopes cannot be maintained. Process tubing shall be installed rigidly with supports to prevent significant vibrations.

E. Brackets and hangers required for mounting of equipment shall be provided. They shall be installed as shown and not interfere with any other equipment.

F. The shield on each process instrumentation cable shall be continuous from source to destination and be grounded at only one ground point for each shield.

G. Investigate each space in the building through which equipment must pass to reach its final location. If necessary, ship material in sections sized to permit passing through restricted areas in the building. Provide on-site service to oversee the installation, the placing and location of system components, their connections to the process equipment panels, cabinets and devices, subject to the Engineer's approval. Certify that field wiring associated with his/her equipment is installed in accordance with best industry practice. Schedule and coordinate work under this section with that of the electrical work specified under applicable Sections of Division 26.

H. Installation of fiber optic cable within control panel and console assemblies. Refer to cable manufacturer's specifications for bend radius. Use cable breakout assembly as recommended by the cable manufacturer. Provide wire basket, strain relief as required to meet manufacturer's strain requirements.

I. Provide local electrical shutoffs and disconnects for all 4-wire field instruments requiring 120 VAC power. Electrical disconnects shall be suitably rated disconnect switches or manual motor starters as specified under Division 26.

J. Loop Tuning - All electronic control stations incorporating PID controllers shall be tuned following field installation and calibration of instrumentation and control system components, but prior to commencement of the specified field tests. Field testing will be immediately ‘failed’ if loop tuning for the entire installed system is not complete.

1. Optimal loop tuning shall be achieved either by auto-tuning software or manually by trial and error, Ziegler-Nichols step-response method, or other documented process tuning method. Assigning common PID factors for identical loops following field tuning of a single typical loop is acceptable. However, tuning documentation shall be submitted for each loop individually as specified in Part 1 of these Specifications.

2. Determine and configure optimal tuning parameters to assure stable, steady state operation of final control elements running under the control of field mounted, dedicated PID controllers or software based PID controllers residing as part of the programmable logic controller system. Each control loop that includes anti-reset windup features shall be adjusted to provide optimum response following startup from an integral action saturation condition.

3. Tune all PID control loops to eliminate excessive oscillating final control elements. Loop parameters shall be adjusted to achieve 1/4 amplitude damping or better. In addition, loop steady state shall be achieved at least as fast as the loop response time associated with critical damping.

4. Loop performance and stability shall be verified in the field following tuning by step changes to setpoint. Submit loop tuning methodology and verification as part of the final system documentation as specified in Part 1.

5. For cascade loops, tune both sets of controllers so that the cascade loop achieves the loop tuning characteristics specified herein.

END OF SECTION

SECTION 40 51 50

CONTROL PANELS AND PANEL MOUNTED EQUIPMENT

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. Refer to Section 40 50 00.

B. Furnish and install control panels and panel mounted equipment as specified herein and shown on the Drawings.

C. All new panels and panel components shall match existing equipment makes and models wherever possible, so that system additions can be most easily integrated with respect to operation and maintenance training, spare parts inventory, and service contracts. Even when exact matches are not possible, equipment furnished must be fully compatible with the existing system. Color, size, and material of new panels should conform to that of existing panels.

D. Furnish the following panels and consoles. Each panel shall be supplied with full sub- panels and side panels as required.

1.2 RELATED WORK

A. Refer to Section 40 50 00.

1.3 SUBMITTALS

A. Refer to Section 40 50 00.

1.4 COORDINATION MEETINGS

A. Refer to Section 40 50 00.

1.5 REFERENCE STANDARDS

A. Refer to Section 40 50 00.

1.6 QUALITY ASSURANCE

A. Refer to Section 40 50 00.

1.7 DELIVERY, STORAGE AND HANDLING

A. Refer to Section 40 50 00.

1.8 NOMENCLATURE AND IDENTIFICATION

A. Refer to Section 40 50 00.

1.9 MAINTENANCE

A. Refer to Section 40 50 00.

1.10 SPARE PARTS AND TEST EQUIPMENT:

A. Refer to Section 40 50 00.

1.11 WARRANTY

A. Refer to Section 40 50 00.

PART 2 PRODUCTS

2.1 GENERAL

A. Refer to Section 40 50 00.

2.2 LIGHTNING/SURGE PROTECTION

A. Refer to Section 40 50 00.

2.3 CONTROL PANEL GENERAL REQUIREMENTS

A. The dimensions within this Section and on the Contract Drawings are for general reference only. Ensure that final enclosure sizing and panel arrangements accommodate all required equipment for a fully integrated and operational system as specified herein and in the Contract Documents.

B. Each control panel and terminal cabinet shall bear the UL label. The UL label shall apply to the enclosure, the specific equipment supplied with the enclosure, and the installation and wiring of the equipment within and on the enclosure. If required for UL labeling, provide ground fault protective devices, isolation transformers, fuses and any other equipment necessary to achieve compliance with UL 508 requirement. The Drawings do not detail all UL 508 requirements.

C. All panel doors shall have a hasp and staple for padlocking. Locks for all panels provided under this Contract shall be keyed alike.

D. The devices designated for rear-of-panel mounting shall be arranged within the panel according to respective panel drawings and in a manner to allow for ease of maintenance and adjustment. Heat generating devices such as power supplies shall be located at or near the top of the panel.

E. The panels shall be completely fabricated, instruments and devices installed and wired at the PCSS's facility.

F. All components shall be mounted in a manner that shall permit servicing, adjustment, testing, and removal without disconnecting, moving, or removing any other component. Components mounted on the inside of panels shall be mounted on removable plates and not directly to the enclosure. Mounting shall be rigid and stable unless shock mounting is required otherwise by the manufacturer to protect equipment from vibration. Component mounting shall be oriented in accordance with manufacturer's recommendations. The internal components shall be identified with suitable plastic or metal engraved nametags mounted adjacent to (not on) each component identifying the component in accordance with the drawing, specifications, and PCSS's data.

G. All exterior panel mounted equipment shall be installed with suitable gaskets, faceplates, etc. required to maintain the NEMA rating of the panel.

H. Nameplates

1. All panels and panel devices shall be supplied with suitable nameplates, which identify the panel and individual devices as required. Unless otherwise indicated, each device nameplate shall include up to three lines with the first line containing the device tag number as shown on the drawings, the second line containing a functional description (e.g., Recirculation Pump No. 1), and the third line containing a functional control description (e.g., Start).

2. Unless escutcheon plates are specified or unless otherwise noted on the Drawings, nameplates shall be 3/32-inch thick, black and white, Lamicoid with engraved inscriptions. The letters shall be Black [White] against a White [Black] background unless otherwise noted. Edges of the nameplates shall be beveled and smooth. Nameplates with chipped or rough edges will not be acceptable.

3. Nameplate fasteners and mounting shall be epoxy adhesive or stainless steel screws for cabinet mounted nameplates

4. For every panel, provide a panel nameplate with a minimum of 1" high letters. Provide legend plates or 1-in by 3-in engraved nameplates with 1/4-in lettering for identification of door mounted control devices, pilot lights, and meters.

5. Single lamicoid nameplates with multiple legends shall be used for grouping of devices such as selector switches and pilot lights that relate to one function.

I. Mounting Elevations

1. ISA Recommended Practice RP60.3 shall be used as a guide in layout and arrangement of panels and panel mounted components. Dimensions shall account for all housekeeping pads that panels will sit on once they are installed.

2. Centerline of indicators and controllers shall be located no lower than 48-inches or higher than 66-inches above the floor on a panel face.

3. Centerline of lights, selector switches, and pushbuttons shall be located no lower than 32-inches or higher than 70-inches above the floor on a panel face.

4. Tops of annunciators shall be located no higher than 86-inches above the floor on a panel face.

5. Installation of panel components shall conform to component manufacturers' guidelines.

2.4 PANEL MATERIALS AND CONSTRUCTION

A. Structure and Enclosure

1. Panels shall be of continuous welded-steel or FRP construction as shown on the Panel Schedule. Provide angle stiffeners as required on the back of the panel face to prevent panel deflection under instrument loading or operation. Internally the panels shall be supplied with a structural framework for instrument support purposes and panel bracing. The internal framework shall permit panel lifting without racking or distortion. Provide removable lifting rings designed to facilitate simple, safe rigging, and lifting of the control panels during installation.

2. Each panel shall be provided with full height, fully gasketed access doors where shown. Doors shall be provided with a three-point stainless steel latch and heavy duty stainless steel locking handle. Panel access doors shall be provided with full length, continuous, piano type stainless steel hinges with stainless steel pins. Front access doors with mounted instruments or control devices shall be of sufficient width to permit door opening without interference from flush mounted instruments.

3. The panels, including component parts, shall be free from sharp edges and welding flaws. Wiring shall be free from kinks and sharp bends and shall be routed for easy access to other components for maintenance and inspection purposes.

4. The panel shall be suitable for top and bottom conduit entry as required by the Electrical Drawings. For top mounted conduit entry, the panel top shall be provided with nominal one-foot square removable access plates, which may be drilled to accommodate conduit and cable penetrations. All conduit and cable penetrations shall be provided with ground bushings, hubs, gasketed locknuts, and other accessories as required to maintain the NEMA rating of the panel and electrical rating of the conduit system.

5. All panels in indoor, dry, non-corrosive environments shall be NEMA 12 unless otherwise noted. All panels in outdoor, wet, and non-chemically corrosive environments shall be NEMA 4 unless otherwise noted. Panels in chemically corrosive environments shall be NEMA 4X unless otherwise noted. All panels located in a hazardous location shall be rated for the type of hazard (e.g., NEMA 7 for Class 1, Division 1).

B. Freestanding and Floor-Mounted Vertical Panels

1. Freestanding and floor-mounted vertical panels shall meet the NEMA classification as shown on the drawings or specified herein. The panels

shall be constructed of sheet steel, suitably braced internally for structural rigidity and strength. All NEMA 4X rated panels shall be constructed of 316 stainless steel. Front panels or panels containing instruments shall be not less than 10 gauge stretcher leveled sheet steel, reinforced to prevent warping or distortion.

C. Wall and Unistrut Mounted Panels

1. All wall and Unistrut mounted panels shall meet the NEMA classification as shown on the drawings or specified herein. The panels shall be constructed of not strength. All NEMA 4X rated wall mounted panels shall be constructed of 316 stainless steel.

D. Finish Requirements

1. All sections shall be descaled, degreased, filled, ground and finished. The enclosure when fabricated of steel shall be finished with two rust resistant phosphate prime coats and two coats of enamel, polyurethane, or lacquer finish which shall be applied by either the hot air spray or conventional cold spray methods. Brushed anodized aluminum, stainless steel, and FRP panels will not require a paint finish.

2. The panels shall have edges ground smooth and shall be sandblasted and then cleaned with a solvent. Surface voids shall be filled and ground smooth.

3. Immediately after cleaning, one coat of a rust-inhibiting primer shall be applied inside and outside, followed by an exterior intermediate and top coat of a two-component type epoxy enamel. A final sanding shall be applied to the intermediate exterior coat before top coating.

4. Apply a minimum of two coats of flat white lacquer on the panel interior after priming.

5. Unless otherwise noted, the finish exterior colors shall be ANSI 61 gray with a textured finish.

E. Print storage pockets shall be provided on the inside of each panel. The storage pockets shall be steel, welded on to the door, and finished to match the interior panel color. The storage pocket shall be sufficient to hold all of the prints required to service the equipment, and to accommodate 8.5 inch by 11 inch documents without folding.

F. Where specified on the Panel Schedule, a folding shelf shall be provided on the inside of the door on all free-standing and floor-mounted panels. The shelf shall be suitable for a laptop computer and shall be placed such that an open laptop computer does not interfere with any door-mounted devices. The folded shelf shall not interfere with any internal panel components when the door is closed. The folding shelf shall automatically lock in the horizontal position when raised. The folding shelf shall be approximately 18 inches wide by 12 inches deep and shall have a minimum distributed load rating of 100 pounds. All parts shall be made of heavy gauge steel and shall be painted white or finished to match the interior panel color.

2.5 ENVIRONMENTAL CONTROL

A. All panels shall be provided with louvers, sun shields, heat sinks, forced air ventilation, or air conditioning units as required to prevent temperature buildup inside of panel. The internal temperature of all panels shall be regulated to a range of 45 Deg F to 104 Deg F under all conditions. Under no circumstances shall the panel cooling or heating equipment compromise the NEMA rating of the panel.

B. PCSS shall submit heat dissipation calculations for every control panel.

C. Except for panels mounted with their backs directly adjacent to a wall, louvers shall be in the rear of the panels, top and bottom, and shall be stamped sheet metal construction.

D. For panels mounted with their backs directly adjacent to a wall, louvers shall be on the sides.

E. Forced air ventilation fans, where used, shall provide a positive internal pressure within the panel, and shall be provided with washable or replaceable filters. Fan motors shall operate on 120-volt, 60-Hz power.

F. For panels with internal heat that cannot be adequately dissipated with natural convection and heat sinks, or forced air ventilation, an air conditioner shall be provided.

G. All outdoor enclosures and enclosures located in unheated areas indoors or in areas subject to humidity and moisture shall be provided with an integral heater, fan, and adjustable thermostat to reduce condensation and maintain the minimum internal panel temperature. Mount the unit near the bottom of the enclosure with discharge away from heat-sensitive equipment. Heater shall be Hoffman DAH [100] [200] [400] [800] Watts, [115] [230] Volt, 50/60 HZ or equal.

2.6 CONTROL PANEL - INTERNAL CONSTRUCTION

A. Internal Electrical Wiring

1. All interconnecting wiring shall be stranded, type MTW, and shall have 600 volt insulation and be rated for not less than 90 degrees Celsius. Wiring for systems operating at voltages in excess of 120 VAC shall be segregated from other panel wiring either in a separate section of a multi-section panel or behind a removable Plexiglas or similar dielectric barrier. Panel layout shall be developed such that technicians shall have complete access to 120 VAC and lower voltage wiring systems without direct exposure to higher voltages.

2. Power distribution wiring on the line side of fuses or breakers shall be 12 AWG minimum. Control wiring on the secondary side of fuses shall be 16

AWG minimum. Electronic analog circuits shall utilize 18 AWG shielded, twisted pair, cable insulated for not less than 600 volts.

3. Power and low voltage DC wiring systems shall be routed in separate wireways. Crossing of different system wires shall be at right angles. Different system wires routed parallel to each other shall be separated by at least 6-inches. Different wiring systems shall terminate on separate terminal blocks. Wiring troughs shall not be filled to more than 60 percent visible fill.

4. Terminations

   a. All wiring shall terminate onto single tier terminal blocks, where each terminal is uniquely and sequentially numbered. Direct wiring between field equipment and panel components is not acceptable.

   b. Multi-level terminal blocks or strips are not acceptable.

   c. Terminal blocks shall be arranged in vertical rows and separated into groups (power, AC control, DC signal). Each group of terminal blocks shall have a minimum of 25 percent spares.

   d. Terminal blocks shall be the compression type, fused, unfused, or switched as shown on the Contract Drawings or specified elsewhere in Division 40.

   e. Discrete inputs and outputs (DI and DO) shall have two terminals per point with adjacent terminal assignments. All active and spare PLC and controller points shall be wired to terminal blocks.

   f. Analog inputs and outputs (AI and AO) shall have three terminals per shielded pair connection with adjacent terminal assignments for each point. The third terminal is for shielded ground connection for cable pairs. Ground the shielded signal cable at the PLC cabinet. All active and spare PLC and controller points shall be wired to terminal blocks.

   g. Wire and tube markers shall be the sleeve type with heat impressed letters and numbers.

   h. Only one side of a terminal block row shall be used for internal wiring. The field wiring side of the terminal shall not be within 6-inches of the side panel or adjacent terminal or within 8-inches of the bottom of free standing panels, or within 3-inches of stanchion mounted panels, or 3-inches of adjacent wireway.

   i. All PLC discrete outputs to the field shall be isolated with an isolating fuse switch terminal block with a flip cover and a neon blown fuse indicator. The single circuit fusible terminal block shall be an Allen Bradley 1492-H4 or equal.

5. All wiring to hand switches and other devices, which are live circuits independent of the panel's normal circuit breaker protection, shall be clearly identified as such.

6. All wiring shall be clearly tagged and color coded. All tag numbers and color coding shall correspond to the panel wiring diagrams and loop drawings prepared by the PCSS. All power wiring, control wiring, grounding, and DC wiring shall utilize different color insulation for each wiring system used. The color coding scheme shall be:

   a. Incoming 120 VAC Hot - Black

   b. 120 VAC Hot wiring downstream of panel circuit breaker – Red

   c. 120 VAC Hot wiring derived from a UPS system – Red with Black stripe

   d. Three phase power – Brown, Orange, Yellow, and Green ground or as specified in Division 26.

   e. 120 VAC neutral - White

   f. Ground - Green

   g. DC power or control wiring – Blue

   h. DC analog signal wiring – Black (+), White (-)

   i. Foreign voltage – Yellow

7. Provide surge protectors on all incoming power supply lines at each panel per the requirements of Section 40 50 00.

8. Each field instrument furnished under Division 40 and shown on the Drawings as deriving input power from the control panel(s) shall have a separate power distribution circuit with a circuit breaker or fuse and blown fuse indication. All instruments requiring 120VAC power shall be powered from the UPS source in the panel where the instrument signals lands.

9. Provide 24VDC power supplies to power field instruments and panel devices. 24VDC power supplies shall be as specified in this Section.

10. Use of adhesive backed cable tie mounts is not acceptable. Cable ties shall be permanently fixed to the panel structure, as needed for controlling cable routing within the panel.

11. Wiring trough for supporting internal wiring shall be plastic type with snap-on covers. The side walls shall be open top type to permit wire changing without disconnecting. Trough shall be supported to the subpanel by stainless steel screws. Trough shall not be bonded to the panel with glue or adhesives.

12. Each panel shall have a single tube, fluorescent light fixture, 20 Watt in size, mounted internally to the ceiling of the panel. Light fixture shall be switched and shall be complete with the lamp.

13. Each panel shall have a specification grade duplex convenience receptacle with ground fault interrupter, mounted internally within a stamped steel device box with appropriate cover. Convenience receptacle shall not be powered from a UPS and shall be protected by a dedicated fuse or circuit breaker.

14. Each panel shall be provided with an isolated copper grounding bus for all signal and shield ground connections. Shield grounding shall be in accordance with the instrumentation manufacturer's recommendations.

15. Each panel shall be provided with a separate copper power grounding bus (safety) in accordance with the requirements of the National Electrical Code.

16. Each panel shall have control, signal, and communication line surge suppression in accordance with Section 40 50 00.

17. All microprocessor-based electronic devices in the panel that are powered by 120VAC shall be powered by the UPS (refer to appropriate Section in Division 40).

18. Each panel shall be provided with a circuit breaker to interrupt incoming power. Provide a minimum of two (2) spare 20-amp breakers.

19. Additional electrical components including transformers, motor starters, switches, circuit breakers, etc. shall be in compliance with the requirements of Division 26.

B. Relays not provided under Division 26 and required for properly completing the control function specified in Division 40, Division 26, or shown on the Drawings shall be provided under this Section.

C. The orientation of all devices including PLC and I/O when installed shall be per the manufacturer’s recommendations. No vertical orientation of PLC racks shall be allowed unless specifically indicated by the manufacturer as an acceptable mounting alternative and also approved by the engineer.

D. Purge system for enclosures located in hazardous areas.

2.7 ELECTRICAL COMPONENTS

A. Refer to Division 26.

B. The control panel shall be provided with a main power circuit breaker and individual fuses for each 120VAC and 24VDC logical circuit.

C. All operating control devices and instruments shall be securely mounted on the exterior door. All controls shall be clearly labeled to indicate function and shall be in accordance with the electrical area classification indicated on the Contract Drawings.

D. The control panel shall be provided with a lightning and surge protection unit on the line side of the main circuit breaker. Unit shall be 600 Volt, 3 Phase, General Electric "Tranquell" Series, or equal.

2.8 PILOT TYPE INDICATING LIGHTS

A. Type: Energy efficient Solid State LED Lamps.

B. Functional:

1. Units shall be provided with low voltage LED lamps suitable for the voltage supplied.

2. Lights supplied with 120V AC power shall have integral reduced voltage tansformers.

3. Lamps shall be replaceable from the front of the unit.

C. Physical:

1. Lens color:

a. Running, on, open – Green.

b. Stopped, off, closed – Red.

c. Alarm – Amber.

d. White - Power on

e. Blue - All other status indications not covered by the above

f. Lens caps shall be approximately 0.46 inch diameter. Provide legend faceplates engraved to indicate the required function of each device; NEMA rating - 4X.

D. Manufacturer(s):

1. Cutler-Hammer.

2. Allen Bradley.

3. Equal.

2.9 SELECTOR SWITCHES AND PUSHBUTTONS

A. Type:

1. Control devices shall be heavy-duty oil tight type with stackable contact blocks.

B. Functional:

1. Provide contact arrangement and switching action as required for the control system specified.

C. Physical:

1. For 120 VAC service provide contacts rated 10 amps at 120 VAC, for 24 VDC service provide silver sliding contacts rated 5 amps at 125 VDC, for electronic (millivolt/ milliamp) switching provide contacts rated lamp at 28 VDC.

2. Pushbuttons shall have flush type operators.

3. Selector switches shall have knob or wing lever operators; NEMA rating - 4X; Provide legend plates denoting switch/pushbutton position/ function.

D. Manufacturer(s):

1. Cutler-Hammer.

2. Allen Bradley.

3. Equal.

2.10 GENERAL PURPOSE RELAYS AND TIME DELAYS

A. Type:

1. General purpose plug-in type.

B. Functional:

1. Contact arrangement/function shall be as required to meet the specified control function; mechanical life expectancy shall be in excess of 10 million.

2. Duty cycle shall be rated for continuous operation; Units shall be provided with integral indicating light to indicate if relay is energized.

3. Solid state time delays shall be provided with polarity protection (DC units) and transient protection.

4. Time delay units shall be adjustable and available in ranges from .1 second to 4.5 hours.

C. Physical:

1. For 120 VAC service provide contacts rated 10 amps at 120 VAC, for 24 VDC service provide contacts rated 5 amps at 28 VDC, for electronic

(milliamp/millivolt) switching applicator provide gold plated contacts rated for electronic service; relays shall be provided with dust and moisture resistant covers.

D. Options/Accessories Required:

1. Provide mounting sockets with pressure type terminal blocks rated 300 volt and 10 amps.

2. Provide mounting rails/holders as required.

E. Manufacturer(s):

1. IDEC.

2. Allen Bradley.

3. Potter & Brumfield.

4. Equal.

2.11 SIGNAL RELAY SWITCHES (CURRENT TRIPS)

A. Type:

1. Solid state, ASIC technology, electronic type.

B. Functional:

1. Input: 4-20 mA.

2. Output: Isolated contact output, double pole double throw, rated 5 amps at 120 VAC.

3. Accuracy: 0.1 percent.

4. Protection: Provide RFI protection.

5. Deadband: Adjustable between 0.1 and 5.0 percent of span.

6. Set point Adjustment: Single Point alarms shall be adjustable to trip on rising or falling input signal, dual point alarms shall be adjustable to trip on rising and falling input signals.

7. Repeatability: Trip point repeatability shall be at least 0.1 percent of span.

C. Physical:

1. Mounting: DIN rail.

D. Manufacturer(s):

1. Action Instruments Slim Pak.

2. Acromag.

3. Equal.

2.12 SIGNAL ISOLATORS/BOOSTERS/CONVERTERS

A. Type:

1. Solid state, ASIC technology; electronic type.

B. Functional:

1. Accuracy: 0.15 percent.

2. Inputs: Current, voltage, frequency, temperature, or resistance as required.

3. Outputs: Current or voltage as required.

4. Isolation: There shall be complete isolation between input circuitry, output circuitry, and the power supply.

5. Adjustments: Zero and span adjustment shall be provided.

6. Protection: Provide RFI protection.

C. Physical:

1. Mounting: DIN rail.

D. Manufacturer(s):

1. Action Instruments Slim Pak.

2. Acromag.

3. Equal.

2.13 SIGNAL SELECTORS, COMPUTATION, AND CONDITIONING RELAYS

A. Type:

1. Solid state, ASIC technology, electronic type.

B. Functional:

1. Inputs: 4-20 mA.

2. Outputs: 4-20 mA.

3. Protection: Provide RFI protection.

4. Operation: The relay shall multiply, add, subtract, select, extract the square root, or perform the specified conditioning/ computation function required. All inputs shall be able to be individually rescaled and biased as Required.

5. Isolation: All inputs, outputs, and power supplies shall be completely isolated.

6. Accuracy: 0.35 percent of span.

7. Adjustments: Multi turn potentiometer for zero, span, scaling, and biasing.

C. Physical:

1. Mounting: DIN rail.

D. Manufacturer(s):

1. Action Instruments Slim Pak.

2. Acromag.

3. Equal.

2.14 INTRINSICALLY SAFE RELAYS

A. Type:

1. Relays shall be of the solid state electronic type in which the energy level of the sensing or actuation circuit is low enough to allow safe usage in hazardous areas.

B. Options Required:

1. Relays shall match power supply provided.

2. Relays shall be located in non-hazardous areas.

C. Manufacturer(s):

1. Consolidated Electric.

2. Gems Safe-Pak.

3. Warrick Controls.

4. R. Stahl, Inc.

5. Equal.

2.15 EMERGENCY ALARM BEACON AND AUDIBLE HORN

A. Beacon alarm light:

1. Type:

    a. Beacon alarm light.

2. Physical:

    a. Beacon alarm light for building exterior mounting shall be 120 VAC, flush mounted, weatherproof construction.

    b. A 750,000-candle power xenon strobe tube and red polycarbonate lens.

3. Manufacturer(s):

    a. Federal Signal.

    b. Edwards.

    c. Wheelock.

    d. Equal.

B. Alarm Horn:

1. Type:

    a. Alarm horn shall be vibrating type for 120 Volts, 60 Hz.

2. Manufacturer(s):

    a. Federal Signal Corp.

    b. Edwards Co.

    c. Benjamin.

    d. Equal.

2.16 INTRINSIC SAFETY BARRIERS (FOR 2-WIRE TRANSMITTER SYSTEMS)

A. Intrinsic safety barriers shall be passive devices requiring no external voltage supply and supplied with series resistors, series fuse and shunt zener diodes to limit the transfer of energy to levels required by intrinsically safe protection between safe and hazardous locations.

B. Unit shall be Factory Mutual approved and certified for use in accordance with National Fire Protection Association (NFPA 493).

C. Manufacturer(s):

1. P&F.

2. Gems.
3. Unitech.
4. Equal.

PART 3 EXECUTION

3.1 INSTALLATION

A. The panels shall be installed at locations as shown on the Contract Drawings.

B. Refer to Section 40 50 00.

3.2 TESTS

A. Refer to Section 40 50 00.

END OF SECTION

SECTION 43 21 63

VERTICAL CENTRIFUGAL PUMP

PART 1 GENERAL

1.1 WORK INCLUDED

A. The work required under this section consists of related items necessary and required to complete the work. The Contractor shall provide all items, and operations, including all labor, materials, equipment, and incidentals necessary for completion of work.

B. Two (2) submersible vertical centrifugal pumps for pumping wastewater from pump station to force main sanitary sewer line.

C. Install the complete pumping system as specified and indicated in the Plans, for a complete and functioning system.

D. Test completed system to check for proper operation of pumps and controls.

1.2 RELATED WORK

A. Section 03 41 00 – Precast Concrete Structures

B. Section 33 01 00 - Pipe and Fittings

C. Section 40 05 23 - Valves and Appurtenances

D. Section 08 30 01 – Lift Station and Valve Vault Access Hatches

E. Division 26 – Electrical

F. Division 40 – Process Integration

1.3 QUALIFICATIONS

A. Acceptable pumps shall be: FLYGT NP 3127 MT 3 439. Pumps shall be provided by a pump manufacturer or supplier who had been in the business of supplying wastewater submersible pump for a period of not less than 5 years.

B. Pumps shall be furnished as a complete unit, including mounting equipment and controls, by a single supplier.

1.4 DESIGN REQUIREMENTS

A. Performance and design requirements:

Unit Designation	FLYGT NP 3127 MT 3 439
Number of units	2
Rated total head, ft	25.9
Capacity @ rated head, gpm	795
Operating head range, ft	25.9 +/- 4'
Min. shut-off head, ft	32
Max shut-off head, ft	32
Max pump operating speed, RPM	1750
Min. discharge nozzle, inches	6
Max motor hp rating	10
Min. hydraulic efficiency at rated operating point, percent	69.8%

B. Materials of Construction:

Pump casing and suction/discharge base	Cast Iron Class 35
Casing adaptor	Cast Iron Class 35
Impeller	Cast Iron Class 35
Pump Shaft	Stainless Steel
Pump Shaft Sleeve	Cast Iron Class 35
Shaft Seal	Tungsten Carbide

1.5 GUARANTEE

A. The Contractor and/or Vendor shall guarantee that the equipment furnished will function satisfactorily for a period of five (5) years from the date of initial operation. Parts, mechanisms or equipment found to be defective in material or workmanship during this period shall be removed, and new materials or equipment shall be furnished and installed by the Contractor without cost to the Owner.

B. Each pump shall be factory tested and shall have met performance requirements prior to shipment to job-site.

1.6 POWER SUPPLY

A. Power supply to equipment will be 240 volts, 60 Hz, 3 phase

1.7 SUBMITTALS

A. Complete fabrications, assembly, and drawings, together with specifications covering materials used, parts, devices and other accessories forming part of the furnished equipment shall be submitted in accordance the General and Special Provisions.

B. Submittals shall also include certified pump curves indicating head-capacity, efficiency, horsepower, rpm, voltage, current draw and other data. Curves shall be plotted from data recorded from factory test of similar pumps or the pumps being submitted.

PART 2 PRODUCTS

2.1 VERTICAL CENTRIFUGAL PUMPS

A. Each pump shall be vertical mount, close coupled, in line single stage centrifugal pump. The pump shall be fitted with drain ports at the bottom of the casing. The pump shall be capable of being serviced without disturbing the system piping.

2.2 PUMP CONTROL

A. Pump control is provided and covered in the electrical plans and under Division 26 Electrical and Division 40 Process Integration.

PART 3 EXECUTION

3.1 INSTALLATION

A. Each pump shall be aligned and connected to the discharge piping.

B. The pump shall be installed under the supervision of a pump manufacturer representative.

3.2 FIELD TESTING AND INSTRUCTION

A. Upon completion of installation, field tests shall be performed on the pumping system to verify that the pump meets the pumping capacity and operate automatically at the sump level as specified in the electrical section. Testing shall be performed by the Contractor under the supervision of a manufacturer’s representative in the presence of the Engineer.

B. After successful completion of the test, the manufacturer’s representative shall submit to Owner, as specified in Section 01 70 00 Contract Closeout, of testing reports and certification that the pumping system meets performance requirements.

C. The manufacturer's representative shall provide to Owner's personnel, a minimum of 4 hours field instruction on the operations and maintenance of the pumping equipment.

D. All cost of testing and instructions shall be at no cost to the Owner.

END OF SECTION