

SPECIFICATION and CONTRACT DOCUMENTS

FOR

SANITARY SEWER LIFT STATIONS J & W

REHABILITATION PROJECT



MORGAN HILL, CALIFORNIA
PUBLIC WORKS DEPARTMENT

PREPARED BY
PUBLIC WORKS DEPARTMENT

February 2018

NOTICE INVITING BIDS

1. **Bid Acceptance.** The City of Morgan Hill (“City”), will accept sealed bids for its Sanitary Sewer Lift Stations J & W Rehabilitation Project (“Project”), by or before Tuesday, March 13, 2018, at 2:30 p.m., at its Development Services Center office, located at 17575 Peak Avenue, Morgan Hill, California, at which time the bids will be publicly opened and read aloud.

2. Project Information.

2.1 Location and Description. The Project sites are located at the following locations:

- Lift Station J: 16035 Jackson Oaks Drive; Morgan Hill, CA
- Lift Station W: 15505 Watsonville Road; Morgan Hill, CA

The Project’s Scope of Work is described as follows, but not limited to:

- Furnishing all labor, materials, equipment, fuel, and transportation required to:
 - Replace the existing wet well’s pumps, piping, fittings, and mounting equipment with new equipment and coat wet well interiors with biological corrosion protection.
 - Replace the existing valve vaults, all existing discharge isolation gate and check valving with new equipment and install new bypass pump connections.
 - Replace existing downstream force main piping with new piping.
 - Install new electrical power pedestal and control equipment, conduits and equipment for PG&E service meter relocation, and new stationary back-up generator.
 - Install new site lighting and overhead canopies for the new power pedestals.
 - Restore surrounding surface pavement and other disturbed improvements.
 - Maintain sewer service at all times during the pump station improvement work.
 - Complete all other work related to the above items as shown on the Plans and as detailed in these Specifications.

2.2 Time for Completion. The planned timeframe for commencement and completion of construction of the Project is one hundred eighty (180) calendar days.

3. License and Registration Requirements.

3.1 License. This Project requires a valid California contractor’s license for the following classification(s): A (General Engineering Contractor).

3.2 DIR Registration. City will not accept a Bid Proposal from or enter into the Contract with a bidder, without proof that the bidder and its Subcontractors are registered with the California Department of Industrial Relations (“DIR”) to perform public work under Labor Code Section 1725.5, subject to limited legal exceptions.

4. Contract Documents. The plans, specifications, bid and contract documents for the Project (“Contract Documents”) may be obtained from the City of Morgan Hill, at 17575 Peak Avenue, Morgan Hill, CA, (408) 778-6480. **Electronic copies of the Contract Documents are available on CD for ten dollars (\$10.00). If mailing by USPS, a five dollar (\$5.00) charge will be added. To download plans and specifications at no charge, register at www.publicpurchase.com.**

5. Bid Proposal and Security.

5.1 Bid Proposal Form. Each Bid must be submitted using the Bid Proposal form provided with the Contract Documents.

5.2 Bid Security. The Bid Proposal must be accompanied by bid security of ten percent (10%) of the maximum bid amount, in the form of a cashier’s or certified check made payable to City of Morgan Hill, or a bid bond executed by a surety licensed to do business in the State of California on the Bid Bond form included with the Contract Documents. The bid security must guarantee that upon award of the bid, the bidder will execute the Contract and submit payment and performance bonds and insurance certificates as required by the Contract Documents within ten (10) days after issuance of the notice of award.

6. Prevailing Wage Requirements.

6.1 General. This Project is subject to the prevailing wage requirements applicable to the locality in which the Work is to be performed for each craft, classification or type of worker needed to perform the Work, including employer payments for health and welfare, pension, vacation, apprenticeship and similar purposes.

6.2 Rates. These prevailing rates are available online at <http://www.dir.ca.gov/DLSR>. Each Contractor and Subcontractor must pay no less than the specified rates to all workers employed to work on the Project. The schedule of per diem wages is based upon a working day of eight (8) hours. The rate for holiday and overtime work must be at least time and one-half (1/2).

6.3 Compliance. The Contract will be subject to compliance monitoring and enforcement by the California Department of Industrial Relations, under Labor Code Section 1771.4.

- 7. Performance and Payment Bonds.** The successful bidder will be required to provide performance and payment bonds for one hundred percent (100%) of the Contract Price.
- 8. Substitution of Securities.** Substitution of appropriate securities in lieu of retention amounts from progress payments is permitted under Public Contract Code Section 22300.
- 9. Subcontractor List.** Each bidder must submit the name, location of the place of business, and California contractor license number and DIR registration number for each Subcontractor who will perform work or service or fabricate or install work for the prime contractor in excess of one-half (1/2) of one percent (1%) of the bid price, using the Subcontractor List form included with the Contract Documents.
- 10. Instructions to Bidders.** Additional and more detailed information is provided in the Instructions for Bidders, which should be carefully reviewed by all bidders before submitting a Bid Proposal.
- 11. Estimated Cost.** The estimated construction cost is \$1.1 Million.

By: Irma Torrez

Date: February 9, 2018

Publication Dates: 1) February 16, 2018

2) February 23, 2018

END OF NOTICE INVITING BIDS

INSTRUCTIONS TO BIDDERS

Each Bid Proposal submitted to the City of Morgan Hill (“City”) for its Sanitary Sewer Lift Stations J & W Rehabilitation Project (“Project”) must be submitted in accordance with the following instructions and requirements:

1. Bid Submission.

1.1 General. Each bid (“Bid Proposal”) must be signed, sealed and submitted to City, using the form provided in the Contract Documents, by or before the date and time set forth in the Notice Inviting Bids, or as amended by subsequent addendum. Faxed or emailed Bid Proposals will not be accepted, unless otherwise specified. Late submissions will be returned unopened. City reserves the right to postpone the date and time for receiving or opening bids. Each bidder is solely responsible for all of its costs to prepare and submit its bid and by submitting a bid waives any right to recover those costs from City. The bid price(s) must include all costs to perform the Work as specified, including all indirect costs such as applicable taxes, insurance and field offices.

1.2 Bid Envelope. The envelope containing the sealed Bid Proposal and required attachments must be clearly labeled as follows:

BID PROPOSAL
Morgan Hill DSC
Sanitary Sewer Lift Stations J & W Rehabilitation Project
City of Morgan Hill
17575 Peak Avenue
Morgan Hill, CA 95037
Attention: Bid Opening/RFP
Bid Date: March 13, 2018
Bid Time: 2:30 p.m.

The envelope must also be clearly labeled, as follows, with the bidder’s name, address, and its registration number with the California Department of Industrial Relations (“DIR”) for bidding on public works contracts (Labor Code sections 1725.5 and 1771.1):

[Contractor company name]
[Street address]
[City, state, zip code]
DIR Registration No. _____

Please note: If City is unable to confirm that the bidder’s DIR registration is current, City must disqualify the bidder and return its bid unopened (Labor Code section 1725.5).

- 2. Examination of Contract Documents and Project Site.** Each bidder is solely responsible for diligent and thorough review of the Contract Documents (as defined in the General Conditions), examination of Project site, and reasonable and prudent inquiry concerning known and potential site conditions prior to submitting a Bid Proposal. However, bidders should not enter onto City's property or the Project site without prior written authorization from City. Bidders are responsible for reporting any errors or omissions in the Contract Documents to City prior to submitting a Bid Proposal, subject to the limitations of Public Contract Code Section 1104. City expressly disclaims responsibility for assumptions the bidder might draw from the presence or absence of information provided by City.
- 3. Requests for Information.** Questions regarding the Project, the bid procedures or any of the Contract Documents must be submitted in writing to Lynette Kong at lynette.kong@morganhill.ca.gov.
- 4. Addenda.** Any addenda issued prior to the bid opening are part of the Contract Documents. Subject to the limitations of Public Contract Code section 4104.5, City reserves the right to issue addenda prior to bid time.
- 5. Brand Designations and "Or Equal" Substitutions.** Any specification designating a material, product, thing, or service by specific brand or trade name, followed by the words "or equal," is intended only to indicate quality and type of item desired, and bidders may request use of any equal material, product, thing, or service. All data substantiating the proposed substitute as an "equal" item must be submitted with the written request for substitution. This provision does not apply to materials, products, things, or services that may lawfully be designated by a specific brand or trade name under Public Contract Code Section 3400(c).

 - 5.1 Pre-Bid Requests.** Any request for submission made before the Contract is awarded must be submitted to the City Engineer at least ten (10) days before the opening of bids so that all interested bidders may be notified of any approved alternative.
 - 5.2 Post-Award Requests.** After the Contract is awarded, Contractor may submit a substitution within fourteen (14) days after the date of award of the Contract, or as specified in the Special Conditions.
- 6. Bidders Interested in More Than One Bid.** No person, firm, or corporation may submit or be a party to more than one (1) Bid Proposal unless alternate bids are specifically called for. However, a person, firm, or corporation that has submitted a subcontract proposal or quote to a bidder may submit subcontract proposals or quotes to other bidders.

- 7. Bid Proposal Form and Enclosures.** Each Bid Proposal must be completed in ink using the Bid Proposal form included in the Contract Documents. The Bid Proposal form should be fully completed without interlineations, alterations, or erasures. Any necessary corrections must be clear and legible, and must be initialed by the bidder's authorized representative. A Bid Proposal submitted with terms such as "negotiable," "will negotiate," or similar, will be considered non-responsive. Each Bid Proposal must be accompanied by bid security, as set forth in Section 9 below, and by the completed Subcontractor List, and Non-Collusion Declaration using the forms included in the Contract Documents.
- 8. Authorization and Execution.** Each Bid Proposal must be signed by the bidder's authorized representative. A Bid Proposal submitted by a partnership must be signed in the partnership name by a general partner with authority to bind the partnership. A Bid Proposal submitted by a corporation must be signed with the legal name of the corporation, followed by the signature and title of two (2) officers of the corporation with full authority to bind the corporation to the terms of the Bid Proposal, under California Corporation Code section 313.
- 9. Bid Security.** Each Bid Proposal must be accompanied by bid security of ten percent (10%) of the maximum bid amount, in the form of a cashier's check, a certified check, or a bid bond, using the form included in the Contract Documents, executed by a surety licensed to do business in the State of California, made payable to City. The bid security must guarantee that upon award of the bid, the bidder will execute and submit the Contract on the form included in the Contract Documents, will submit payment and performance bonds one hundred percent (100%) of the maximum Contract Price, and will submit the insurance certificates and endorsements as required by the Contract Documents within ten (10) days after issuance of the notice of award.
- 10. Withdrawal of Bid Proposals.** A Bid Proposal may not be withdrawn for a period of ninety (90) days after the bid opening without forfeiture of the bid security, except as authorized for material error under Public Contract Code Section 5100 et seq.
- 11. Bid Protest.** Any bid protest must be in writing and received by City at the City Attorney's Office at 17575 Peak Avenue, Morgan Hill, CA, (Fax: (408) 779-1592), before 5:00 p.m. no later than two (2) working days following bid opening (the "Bid Protest Deadline") and must comply with the following requirements:

 - 11.1 General.** Only a bidder who has actually submitted a Bid Proposal is eligible to submit a bid protest against another bidder. Subcontractors are not eligible to submit bid protests. A bidder may not rely on the bid protest

submitted by another bidder, but must timely pursue its own protest. If required by City, the protesting bidder must submit a non-refundable fee in the amount specified by City, based upon City's reasonable costs to administer the bid protest. Any such fee must be submitted to City no later than the Bid Protest Deadline, unless otherwise specified. For purposes of this Section 11, a "working day" means a day that City is open for normal business, and excludes weekends and holidays observed by City.

11.2 Protest Contents. The bid protest must contain a complete statement of the basis for the protest and all supporting documentation. Material submitted after the Bid Protest Deadline will not be considered. The protest must refer to the specific portion or portions of the Contract Documents upon which the protest is based. The protest must include the name, address, email address, and telephone number of the person representing the protesting bidder if different from the protesting bidder.

11.3 Copy to Protested Bidder. A copy of the protest and all supporting documents must be concurrently transmitted by fax or by email, by or before the Bid Protest Deadline, to the protested bidder and any other bidder who has a reasonable prospect of receiving an award depending upon the outcome of the protest.

11.4 Response to Protest. The protested bidder may submit a written response to the protest, provided the response is received by City before 5:00 p.m., within two (2) working days after the Bid Protest Deadline or after actual receipt of the bid protest, whichever is sooner (the "Response Deadline"). The response must include all supporting documentation. Material submitted after the Response Deadline will not be considered. The response must include the name, address, email address, and telephone number of the person representing the protested bidder if different from the protested bidder.

11.5 Copy to Protesting Bidder. A copy of the response and all supporting documents must be concurrently transmitted by fax or by email, by or before the Response Deadline, to the protesting bidder and any other bidder who has a reasonable prospect of receiving an award depending upon the outcome of the protest.

11.6 Exclusive Remedy. The procedure and time limits set forth in this section are mandatory and are the bidder's sole and exclusive remedy in the event of bid protest. A bidder's failure to comply with these procedures will constitute a waiver of any right to further pursue a bid protest, including filing a Government Code Claim or initiation of legal proceedings.

11.7 Right to Award. City reserves the right to award the Contract to the bidder it has determined to be the responsible bidder submitting the lowest

responsive bid, and to issue a notice to proceed with the Work notwithstanding any pending or continuing challenge to its determination.

- 12. Rejection of Bids; Award of Contract.** City reserves the right, acting in its sole discretion, to waive immaterial bid irregularities, the right to accept or reject any and all bids, or to abandon the Project entirely. The Contract will be awarded, if at all, within ninety (90) days after opening of bids or as otherwise specified in the Special Conditions, to the responsible bidder that submitted the lowest responsive bid.
- 13. Bonds.** The successful bidder is required to submit payment and performance bonds as specified in the Contract Documents using the bond forms included in the Contract Documents. All required bonds must be calculated on the maximum total Contract price as awarded, including additive alternates, if applicable.
- 14. Evidence of Responsibility.** Within twenty four (24) hours following a request by City, a bidder must submit to City satisfactory evidence showing the bidder's financial resources, the bidder's experience in the type of work being required by City, the bidder's organization available for the performance of the Contract and any other required evidence of the bidder's qualifications to perform the proposed Contract. City may consider such evidence before making its decision awarding the proposed Contract.
- 15. License(s).** The successful bidder and its Subcontractor(s) must possess the California contractor's license(s) in the classification(s) required by law to perform the Work.
- 16. Taxes.** The bid price must include all applicable federal, state, and local taxes.
- 17. Ineligible Subcontractor.** Any Subcontractor who is ineligible to perform work on a public works project under Labor Code Sections 1777.1 or 1777.7 is prohibited from performing work on this Project.
- 18. Subcontract Limitation.** The successful bidder may not subcontract out more than fifty percent (50%) of the original total contract price, except that any items of work in the Engineer's Estimate designated "Specialty Items" may be performed by subcontract and the value of the work may be deducted from the original total contract price before computing the amount of work required to be performed by Contractor's own forces. When items of work in the Engineer's Estimate are preceded by the letters (S) or (S-F), those items are designated as "Specialty Items." Where an entire item is subcontracted, the value of work subcontracted will be based on the contract item bid price. When a portion of an item is subcontracted, the

value of work subcontracted will be determined by the Engineer based on the estimated percentage of the contract item bid price.

19. **DIR Registration.** City will not accept a Bid Proposal from or enter into the Contract with a bidder, without proof that the bidder and its Subcontractors are registered with the DIR to perform public work under Labor Code Section 1725.5, subject to limited legal exceptions.
20. **Bid Schedule.** Bidders are required to fully complete the Bid Schedule form accompanying the Bid Proposal form with unit prices as indicated, and to submit the completed Bid Schedule with their Bid Proposal.

20.1 Incorrect Totals. In the event of a computational error for any bid item (base bid or alternate) resulting in an incorrect extended total for that item, the submitted base bid or bid alternate total will be adjusted to reflect the corrected amount (estimated quantity X unit cost), unless the cumulative amount of correction changes the total amount of the base bid or bid alternate by more than five percent (5%). In the event of a discrepancy between the actual total of the itemized or unit prices shown on the Bid Schedule for the base bid, and the amount entered as the base bid on the Bid Proposal form, the actual total of the itemized or unit prices shown on the Bid Schedule for the base bid will be deemed the base bid price. Likewise, in the event of a discrepancy between the actual total of the itemized or unit prices shown on the Bid Schedule for any bid alternate, and the amount entered for the alternate on the Bid Proposal form, the actual total of the itemized prices shown on the Bid Schedule for that alternate will be deemed the alternate price. Nothing in this provision is intended to prevent a bidder from requesting to withdraw its bid for material error under Public Contract Code Section 5100 et seq.

20.2 Estimated Quantities. The quantities shown on the Bid Schedule are estimated and the actual quantities required to perform the Work may be greater or less than the estimated amount. The Contract Price will be adjusted to reflect the actual quantities required for the Work based on the itemized or unit prices provided in the Bid Schedule, with no allowance for anticipated profit for quantities that are deleted or decreased.

21. **Bidder's Questionnaire.** A completed, signed Bidder's Questionnaire using the form provided with the Contract Documents and including all required attachments must be submitted within 48 hours following a request by City. A bid that does not fully comply with this requirement may be rejected as nonresponsive. A bidder who submits a Bidder's Questionnaire which is subsequently determined to contain false or misleading information, or material omissions, may be disqualified as non-responsible.

- 22. Safety Orders.** Each Bid must include a bid item for adequate sheeting, shoring, and bracing, or equivalent method, for the protection of life or limb, which comply with safety orders as required by Labor Code Section 6707.

END OF INSTRUCTIONS TO BIDDERS

BID PROPOSAL

Sanitary Sewer Lift Stations J & W Rehabilitation Project

_____ (“Bidder”) hereby submits this Bid Proposal to the City of Morgan Hill (“City”) for the above-referenced project (“Project”) in response to the Notice Inviting Bids and in accordance with the Contract Documents referenced therein.

1. **Base Bid.** Bidder proposes to perform and fully complete the Work for the Project as specified in the Contract Documents, within the time required for full completion of the Work, for the following price (“Base Bid”):
\$ _____.

2. **Addenda.** Bidder acknowledges receipt of the following addenda:

Addendum:	Date Received:	Addendum:	Date Received:
#01	_____	#05	_____
#02	_____	#06	_____
#03	_____	#07	_____
#04	_____	#08	_____

3. **Bidder’s Warranties.** By signing and submitting this Bid Proposal, Bidder warrants the following:

3.1 **Examination of Contract Documents.** Bidder has thoroughly examined the Contract Documents, and represents that, to the best of Bidder’s knowledge there are no errors, omissions, or discrepancies in the Contract Documents subject to the limitations of Public Contract Code Section 1104.

3.2 **Examination of Worksite.** Bidder has had the opportunity to examine the Worksite and local conditions at the Project location.

3.3 **Bidder is Qualified.** Bidder is fully qualified to perform the Work.

3.4 **Responsibility for Bid.** Bidder has carefully reviewed this Bid Proposal and is solely responsible for any errors or omissions contained in its completed Bid.

4. **Award of Contract .** By signing and submitting this Bid Proposal, Bidder agrees that if Bidder is awarded the Contract for the Project, that within ten (10) days following issuance of the notice of award to Bidder, Bidder will do all of the following:

4.1 Execute Contract. Enter into the Contract with City in accordance with the terms of this Bid Proposal, by signing and submitting to City the Contract prepared by City using the form included with the Contract Documents;

4.2 Submit Required Bonds. Submit to City a payment bond and a performance bond, each for one hundred percent (100%) of the Contract Price, using the bond forms provided and in accordance with the requirements of the Contract Documents; and

4.3 Insurance Requirements. Submit to City the insurance certificate(s) and endorsement(s) as required by the Contract Documents.

5. Wage Theft Prevention. All Bidders are expected to have read and understand the “Wage Theft Prevention Policy” adopted by the City Council on July 26, 2017.

The undersigned Bidder certifies that neither Bidder nor its principals have been found by a final court judgement or final administrative action of an investigatory agency to have violated federal, state or local wage and hour laws within the past five years from the date of the submitted bid. Bidder or its principals who are unable to so certify, must disclose wage and hour violations, and shall provide a copy of (i) the court order and judgment and/or final administrative decision; and (ii) documents demonstrating either that the order/judgment has been satisfied, or if the order/judgment has not been fully satisfied, a written and signed description of Bidder’s efforts to date to satisfy the order/judgment. Signing this bid shall constitute signature of this Certification.

The City, at its sole discretion, may disqualify a bidder based on one or more disclosed judgments consistent with the criteria set forth in the Policy.

6. Bid Security. As a guarantee that if awarded the Contract, it will perform its obligations under Section 4, above, Bidder is enclosing bid security in the amount of ten percent (10%) of its maximum bid amount in the following form:

_____ A cashier’s check or certified check payable to City of Morgan Hill and issued by _____ Bank in the amount of \$_____.

_____ A bid bond, using the Bid Bond form included with the Contract Documents, payable to City of Morgan Hill and executed by a surety licensed to do business in the State of California.

This Bid Proposal is hereby submitted on _____, 20__:

s/ _____

Name and Title [print]

Company Name

License # and Classification

DIR Registration #

Address

Phone

City, State, Zip

Fax

END OF BID PROPOSAL

BID SCHEDULES I, II, & III – GENERAL

Sanitary Sewer Lift Stations J & W Rehabilitation

This Bid Schedule must be completed in ink and must be included with the sealed Bid Proposal. The unit cost for each item must be inclusive of all costs, whether direct or indirect, including profit and overhead. The sum of all amounts entered in the “Extended Total” column must be identical to the Base Bid price entered in Section 1 of the Bid Proposal Form. Quantities shown are required for bid purposes and may or may not be final pay quantities. Actual quantities, if different, must be substantiated during the Project by the Contractor (either by field measurement, trucking tags, or other means acceptable to the Engineer).

I. Bid Schedule I: Lift Station J (Bid Schedule I Total on the following page)

Bid Item	Description of Bid Item	Approximate Quantity/Unit of Measure	Unit Price	Extended Total
1	Mobilization	1 LS	\$	\$
2	Excavation Protection	1 LS	\$	\$
3	Bypass Pumping and Pumping	1 LS	\$	\$
4	Station Demolition	1 LS	\$	\$
5	Pumps and Base Elbows	2 EA	\$	\$
6	Miscellaneous Pump Equipment	1 LS	\$	\$
7	Piping, Fittings, and Valves	1 LS	\$	\$
8	New Force Main	24 LF	\$	\$
9	Wet Well Improvements	1 LS	\$	\$
10	Wet Well Coating	1 LS	\$	\$
11	Precast Concrete Vault	1 LS	\$	\$
12	Electrical Panel Concrete Slab	1 LS	\$	\$
13	Canopy	1 LS	\$	\$
14	Generator Concrete Slab	1 LS	\$	\$
15	Block Retaining Walls	1 LS	\$	\$
16	Complete Electrical Installation	1 LS	\$	\$
17	Removable Guard Posts	3 EA	\$	\$
18	Asphalt Concrete Paving	1 LS	\$	\$
19	Base Rock Ground Cover	1 LS	\$	\$

Bid Schedule I: Lift Station J Total (Items #1-19)	\$
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II. Bid Schedule II: Lift Station W

Bid Item	Description of Bid Item	Approximate Quantity/Unit of Measure	Unit Price	Extended Total
20	Mobilization	1 LS	\$	\$
21	Excavation Protection	1 LS	\$	\$
22	Bypass Pumping and Pumping	1 LS	\$	\$
23	Station Demolition	1 LS	\$	\$
24	Pumps and Base Elbows	2 EA	\$	\$
25	Spare Pump	1 EA	\$	\$
26	Miscellaneous Pump Equipment	1 LS	\$	\$
27	Piping, Fittings, and Valves	1 LS	\$	\$
28	New Force Main	8 LF	\$	\$
29	Wet Well Improvements	1 LS	\$	\$
30	Wet Well Coating	1 LS	\$	\$
31	Sanitary Sewage Storage Vault Coating	1 LS	\$	\$
32	Precast Concrete Vault	1 LS	\$	\$
33	Electrical Panel Concrete Slab	1 LS	\$	\$
34	Canopy	1 LS	\$	\$
35	Complete Electrical Installation	1 LS	\$	\$
36	Hose Bib and Stand	1 LS	\$	\$
Bid Schedule II: Lift Station W Total (Items #20-36)			\$	

III. Bid Schedule III: Supplemental Work

Bid Item	Description of Bid Item	Approximate Quantity/Unit of Measure	Unit Price	Extended Total
37	Supplemental Work	1 LS	\$50,000	\$50,000
Bid Schedule III: Supplemental Work Total (Item #37)			\$50,000	

TOTAL BASE BID FOR SCHEDULES I, II, & III (TOTAL = I + II + III):	\$
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END OF BID SCHEDULE

NONCOLLUSION DECLARATION

(To be executed by bidder and submitted with bid)

State of California)	ss.
)	
County of _____)	

The undersigned declares:

I am the _____ [title] of _____ [business name], the party making the foregoing bid.

The bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation. The bid is genuine and not collusive or sham. The bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid. The bidder has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or to refrain from bidding. 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. All statements contained in the bid are true. 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, to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof, to effectuate a collusive or sham bid, and has no paid and will not pay, any person or entity for such purpose.

This declaration is intended to comply with California Public Contract Code Section 7106 and Title 23 U.S.C Section 112.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this declaration is executed on _____ [date], at _____ [city], _____ [state].

s/ _____

Name [print]

BID BOND

_____ (“Bidder”) has submitted a bid, dated _____, 20____ (“Bid”), to the City of Morgan Hill (“City”) for work on the Sanitary Sewer Lift Stations J & W Rehabilitation Project (“Project”). Under this duly executed bid bond (“Bid Bond”), Bidder as Principal and _____, its surety (“Surety”), are bound to City as obligee in the penal sum of ten percent (10%) of the maximum amount of the Bid (the “Bond Sum”). Bidder and Surety bind themselves and their respective heirs, executors, administrators, successors and assigns, jointly and severally, as follows:

1. **General.** If Bidder is awarded the Contract for the Project, Bidder will enter into the Contract with City in accordance with the terms of the Bid.
2. **Submittals.** Within ten (10) days following issuance of the notice of award to Bidder, Bidder must submit to City the following:
 - 2.1 **Contract.** The executed Contract, using the form provided by City in the Project contract documents (“Contract Documents”);
 - 2.2 **Payment Bond.** A payment bond for one hundred percent (100%) of the maximum Contract Price, executed by a surety licensed to do business in the State of California using the Payment Bond form included with the Contract Documents;
 - 2.3 **Performance Bond.** A performance bond for one hundred percent (100%) of the maximum Contract Price, executed by a surety licensed to do business in the State of California using the Performance Bond form included with the Contract Documents; and
 - 2.4 **Insurance.** The insurance certificate(s) and endorsement(s) required by the Contract Documents, and any other documents required under the Instructions for Bidders.
3. **Enforcement.** If Bidder fails to execute the Contract and to submit the bonds and insurance certificates as required by the Contract Documents, Surety guarantees that Bidder forfeits the Bond Sum to City. Any notice to Surety may be given in the manner specified in the Contract and delivered or transmitted to Surety as follows:

Attn: _____
Address: _____
City/State/Zip: _____
Phone: _____

Fax: _____
Email: _____

- 4. Duration; Waiver.** If Bidder fulfills its obligations under Section 2, above, then this obligation will be null and void; otherwise it will remain in full force and effect for ninety (90) days following award of the Contract or until this Bid Bond is returned to Bidder, whichever occurs first. Surety waives the provisions of Civil Code Sections 2819 and 2845.

This Bid Bond is entered into and is effective on _____,
20____.

SURETY:

s/ _____

Name: _____

Title: _____

(Attach Acknowledgement, Notary Seal, and Attorney-In-Fact Certificate)

CONTRACTOR:

s/ _____

Name: _____

Title: _____

APPROVED AS TO FORM:

By: _____
Donald A. Larkin, City Attorney

Date: _____

BIDDER'S QUESTIONNAIRE

SANITARY SEWER LIFT STATIONS J & W REHABILITATION PROJECT

Within forty eight (48) hours following a request by City, a bidder must submit to City a completed, signed Bidder's Questionnaire using this form and including all required attachments. City may request the Questionnaire from one (1) or more of the apparent low bidders following the bid opening, and may use the completed Questionnaire to evaluate a bidder's qualifications for this Project. The Questionnaire must be filled out completely, accurately, and legibly. Any errors, omissions, or misrepresentations in completion of the Questionnaire may be grounds for rejection of the bid or termination of a Contract awarded pursuant to the bid.

Part 1: General Information

Bidder Business Name: _____ ("Bidder")

Check One: Corporation
 Partnership
 Sole Proprietorship
 Joint Venture of: _____
 Other: _____

Address: _____

Phone: _____

Fax: _____

Owner of Company: _____

Contact Person: _____

Email: _____

Bidder's California Contractor's License Number(s):

Part 2: Bidder Experience

1. How many years has Bidder been in business under its present business name? _____

2. Has Bidder completed projects similar in type and size to this Project as a general contractor? _____

3. Has Bidder ever been disqualified on grounds that it is not responsible? If yes, provide additional information on a separate sheet of paper regarding the disqualification, including the name and address of the agency or owner of the subject project, the type and size of the project, the reasons that Bidder was disqualified as not responsible, and the month and year in which the disqualification occurred.

4. Has Bidder ever been terminated from a construction project, either as a general contractor or as a subcontractor? If yes, provide additional information on a separate sheet of paper regarding the termination, including the name and address of the agency or owner of the subject project, the type and size of the project, whether Bidder was under contract as a general contractor or a subcontractor, the reasons that Bidder was terminated, and the month and year in which the termination occurred.

5. Provide information about Bidder's past projects performed as general contractor as follows:

5.1 Six (6) most recently completed public works projects within the last three (3) years;

5.2 Three (3) largest completed projects within the last three (3) years; and

5.3 Any project which is similar to this Project.

6. Use separate sheets of paper provide all of the following information for each project identified in response to the above three (3) categories:

6.1 Project name

6.2 Location

6.3 Owner

6.4 Owner contact (name and current phone number)

6.5 Architect or engineer name

6.6 Architect or engineer contact (name and current phone number)

6.7 Project manager (name and current phone number)

6.8 Description of project, scope of work performed

6.9 Initial contract value (at time of bid award)

6.10 Final cost of construction (including change orders)

6.11 Original scheduled completion date

6.12 Time extensions granted (number of days)

6.13 Actual date of completion

6.14 Number and amount of stop notices or mechanic's liens filed

- 6.15 Amount of liquidated damages assessed against Bidder
- 6.16 Nature and resolution of any claim, lawsuit, and/or arbitration between Bidder and the owner.

Part 3: Verification

In signing this document, I, the undersigned, declare that I am duly authorized to sign and submit this Bidder's Questionnaire on behalf of the named bidder, and that all responses and information set forth in this Bidder's Questionnaire and accompanying attachments are, to the best of my knowledge, true, accurate and complete as of the date of submission. **I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.**

Signature: _____ Date: _____

By [name, title]: _____

END OF BIDDER'S QUESTIONNAIRE

CONTRACT

This public works contract ("Contract") is entered into by and between the City of Morgan Hill ("City") and _____ ("Contractor") for work on the Sanitary Sewer Lift Stations J & W Rehabilitation Project ("Project").

The parties agree as follows:

1. **Award of Contract.** In response to the Notice Inviting Bids, Contractor has submitted a Bid Proposal to perform work on the Project, and on _____, 20____, (contract date) City authorized award of this Contract to Contractor for the amount of Contractor's bid.
2. **Contract Documents.** The Contract Documents incorporated into this Contract include and are comprised of all of the following:
 - 2.1 Notice Inviting Bids;
 - 2.2 Instructions to Bidders;
 - 2.3 Addenda, if any;
 - 2.4 Bid Proposal and attachments thereto;
 - 2.5 Contract;
 - 2.6 Payment and Performance Bonds;
 - 2.7 General Conditions;
 - 2.8 Special Conditions;
 - 2.9 Project Drawings and Specifications;
 - 2.10 Change Orders, if any;
 - 2.11 Notice of Award;
 - 2.12 Notice to Proceed;
 - 2.13 And the following: No other documents.
3. **Contractor's Obligations.** Contractor agrees to perform all of the Work required for the Project, as specified in the Contract Documents. Contractor must provide, furnish, and supply all things necessary and incidental for the timely performance and completion of the Work, including all necessary labor, materials, equipment, transportation, and utilities, unless otherwise specified in the Contract Documents. Contractor must use its best efforts to complete the Work in a professional and expeditious manner and to meet or exceed the performance standards required by the Contract Documents.

4. **Payment.** As full and complete compensation for Contractor's timely performance and completion of the Work in strict accordance with the terms and conditions of the Contract Documents, City will pay Contractor

Dollars (\$ _____) (the "Contract Price"), in accordance with the payment provisions in the General Conditions. The Contract Price includes all applicable federal, state, and local taxes.

5. **Time for Completion.** Contractor will fully complete the Work for the Project within one hundred eighty (180) calendar days from the commencement date given in the Notice to Proceed ("Contract Time"). By signing below, Contractor expressly waives any claim for delayed early completion.

6. **Liquidated Damages.** If Contractor fails to complete the Work within the Contract Time, City will assess liquidated damages in the amount of One Thousand Dollars (\$1,000.00) for each day of unexcused delay in completion, and the Contract Price will be reduced accordingly.

7. **Labor Code Compliance.**

7.1 **General.** This Contract is subject to all applicable requirements of Chapter 1 of Part 7 of Division 2 of the Labor Code, including requirements pertaining to wages, working hours and workers' compensation insurance.

7.2 **Prevailing Wages.** This Project is subject to the prevailing wage requirements applicable to the locality in which the Work is to be performed for each craft, classification or type of worker needed to perform the Work, including employer payments for health and welfare, pension, vacation, apprenticeship and similar purposes. Copies of these prevailing rates are available online at <http://www.dir.ca.gov/DLSR>.

7.3 **DIR Registration.** City will not enter into the Contract with a bidder, without proof that the bidder and its Subcontractors are registered with the California Department of Industrial Relations ("DIR") to perform public work under Labor Code Section 1725.5, subject to limited legal exceptions.

8. **Workers' Compensation Certification.** Under Labor Code Section 1861, by signing this Contract, Contractor certifies as follows: "I am aware of the provisions of Labor Code Section 3700 which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply

with such provisions before commencing the performance of the Work on this Contract.”

9. **Notice.** Any notice, billing, or payment required by the Contract Documents must be made in writing, and sent to the other party by personal delivery, U.S. Mail, a reliable overnight delivery service, facsimile, or by email as a PDF (or comparable) file. Notice is deemed effective upon delivery unless otherwise specified. Notice for each party must be given as follows:

City:

City of Morgan Hill
17575 Peak Avenue
Morgan Hill, CA 95037
Phone: (409) 779-7259
Attn: City Clerk
Email: michelle.wilson@morganhill.ca.gov
Copy to: lynette.kong@morganhill.ca.gov

Contractor:

Name: _____
Address: _____
City/State/Zip: _____
Phone: _____
Attn: _____
Email: _____
Copy to: _____

10. **General Provisions.**

- 10.1 **Assignment and Successors.** Contractor may not assign its rights or obligations under this Contract, in part or in whole, without City’s written consent. This Contract is binding on Contractor’s successors and permitted assigns.
- 10.2 **Third Party Beneficiaries.** There are no intended third party beneficiaries to this Contract except as expressly provided in the General Conditions or Special Conditions.
- 10.3 **Governing Law and Venue.** This Contract will be governed by California law and venue will be in the Superior Court of Santa Clara County, and no other place.

- 10.4 Amendment.** No amendment or modification of this Contract will be binding unless it is in a writing duly authorized and signed by the parties to this Contract.
- 10.5 Integration; Severability.** This Contract and the Contract Documents incorporated herein, including authorized amendments or Change Orders thereto, constitute the final, complete, and exclusive terms of the agreement between City and Contractor. If any provision of the Contract Documents, or portion of a provision, is determined to be illegal, invalid, or unenforceable, the remaining provisions of the Contract Documents will remain in full force and effect.
- 10.6 Authorization.** Each individual signing below warrants that he or she is authorized to do so by the party that he or she represents, and that this Contract is legally binding on that party. If Contractor is a corporation, signatures from two (2) officers of the corporation are required pursuant to California Corporation Code Section 313.

[Signatures are on the following page.]

AS SET FORTH IN CA. CORP. CODE § 313, TWO SIGNATURES ARE REQUIRED FOR CALIFORNIA CORPORATIONS:

- (1) CHAIRPERSON OF THE BOARD, PRESIDENT, OR VICE PRESIDENT; AND
- 2) SECRETARY, ASSISTANT SECRETARY, CHIEF FINANCIAL OFFICER OR ASSISTANT TREASURER.

The parties agree to this Contract as witnessed by the signatures below:

CITY OF MORGAN HILL:

CONTRACTOR:

Christina J. Turner
City Manager

Name/Title [print]

Date: _____

Date: _____

Attest:

Corporate entities must provide a second signature:

Michelle Wilson
Deputy City Clerk

Name/Title [print]

Date: _____

Date: _____

Approved as to Form:

Contractor's License Number(s)

Donald A. Larkin
City Attorney

Expiration Date(s)

Date: _____

Seal:

DIR Registration Number

END OF CONTRACT

PAYMENT BOND

The City of Morgan Hill ("City") and _____ ("Contractor") have entered into a contract, dated _____, 20__ ("Contract") for work on the Sanitary Sewer Lift Stations J & W Rehabilitation Project ("Project"). The Contract is incorporated by reference into this Payment Bond ("Bond").

1. **General.** Under this Bond, Contractor as principal and _____, its surety ("Surety"), are bound to City as obligee in an amount not less than (\$ _____) ("Bond Sum"), under California Civil Code Sections 9550, et seq.

2. **Surety's Obligation.** If Contractor or any of its Subcontractors fails to pay any of the persons named in California Civil Code Section 9100 amounts due under the Unemployment Insurance Code with respect to work or labor performed under the Contract, or for any amounts required to be deducted, withheld, and paid over to the Employment Development Department from the wages of employees of Contractor and its Subcontractors, under California Unemployment Insurance Code Section 13020, with respect to the work and labor, then Surety will pay for the same.

3. **Beneficiaries.** This Bond inures to the benefit of any of the persons named in California Civil Code Section 9100, so as to give a right of action to those persons or their assigns in any suit brought upon this Bond. Contractor must promptly provide a copy of this Bond upon request by any person with legal rights under this Bond.

4. **Duration.** If Contractor promptly makes payment of all sums for all labor, materials, and equipment furnished for use in the performance of the Work required by the Contract, in conformance with the time requirements set forth in the Contract and as required by California law, Surety's obligations under this Bond will be null and void. Otherwise, Surety's obligations will remain in full force and effect.

5. **Waivers.** Surety waives any requirement to be notified of alterations to the Contract or extensions of time for performance of the Work under the Contract. Surety waives the provisions of Civil Code Sections 2819 and 2845. City waives requirement of a new bond for any supplemental contract under Civil Code Section 9550. Any notice to Surety may be given in the manner specified in the Contract and delivered or transmitted to Surety as follows:

Attn: _____
Address: _____
City/State/Zip: _____

Phone: _____
Fax: _____
Email: _____

6. **Law and Venue.** This Bond will be governed by California law, and any dispute pursuant to this Bond will be venued in the Superior Court of Santa Clara County, and no other place. Surety will be responsible for City's attorneys' fees and costs in any action to enforce the provisions of this Bond.
7. **Effective Date; Execution.** This Bond is entered into and is effective on _____, 20__.

SURETY:

CONTRACTOR:

s/ _____

s/ _____

Name: _____

Name: _____

Title: _____

Title: _____

(Attach Acknowledgment with Notary Seal and Power of Attorney)

APPROVED AS TO FORM:

By: _____
Donald A. Larkin, City Attorney

Date: _____

END OF PAYMENT BOND

PERFORMANCE BOND

The City of Morgan Hill ("City") and _____ ("Contractor") have entered into a contract, dated _____, 20____ ("Contract") for work on the Sanitary Sewer Lift Stations J & W Rehabilitation Project ("Project"). The Contract is incorporated by reference into this Performance Bond ("Bond").

1. **General.** Under this Bond, Contractor as Principal and _____, its surety ("Surety"), are bound to City as obligee for an amount not less than Dollars (\$_____) (the "Bond Sum"). By executing this Bond, Contractor and Surety bind themselves and their respective heirs, executors, administrators, successors and assigns, jointly and severally, to the provisions of this Bond.
2. **Surety's Obligations; Waiver.** If Contractor fully performs its obligations under the Contract, including its warranty obligations under the Contract, Surety's obligations under this Bond will become null and void upon recordation of the notice of completion, provided Contractor has timely provided a warranty bond as required under the Contract. Otherwise Surety's obligations will remain in full force and effect until expiration of the one (1) year warranty period under the Contract. Surety waives any requirement to be notified of and further consents to any alterations to the Contract made under the applicable provisions of the Contract Documents, including changes to the scope of Work or extensions of time for performance of Work under the Contract. Surety waives the provisions of Civil Code Sections 2819 and 2845.
3. **Application of Contract Balance.** Upon making a demand on this Bond, City will make the Contract Balance available to Surety for completion of the Work under the Contract. For purposes of this provision, the Contract Balance is defined as the total amount payable by City to Contractor as the Contract Price minus amounts already paid to Contractor, and minus any liquidated damages, credits, or backcharges to which City is entitled under the terms of the Contract.
4. **Contractor Default.** Upon written notification from City that Contractor is in default under Article 13 of the Contract General Conditions, time being of the essence, Surety must act within the time specified in Article 13 to remedy the default through one (1) of the following courses of action:
 - 4.1 Arrange for completion of the Work under the Contract by Contractor, with City's consent, but only if Contractor is in default solely due to its financial inability to complete the Work;

4.2 Arrange for completion of the Work under the Contract by a qualified contractor acceptable to City, and secured by performance and payment bonds issued by an admitted surety as required by the Contract Documents, at Surety's expense, or

4.3 Waive its right to complete the Work under the Contract and reimburse City the amount of City's costs to have the remaining Work completed.

5. Surety Default. If Surety defaults on its obligations under the Bond, City will be entitled to recover all costs it incurs due to Surety's default, including legal, design professional, or delay costs.

6. Notice. Any notice to Surety may be given in the manner specified in the Contract and delivered or transmitted to Surety as follows:

Attn: _____
Address: _____
City/State/Zip: _____
Phone: _____
Fax: _____
Email: _____

7. Law and Venue. This Bond will be governed by California law, and any dispute pursuant to this Bond will be venued in the Superior Court of Santa Clara County, and no other place. Surety will be responsible for City's attorneys' fees and costs in any action to enforce the provisions of this Bond.

8. Effective Date; Execution. This Bond is entered into and effective on _____, 20__.

[Signatures are on the following page.]

SURETY:

s/ _____

Name: _____

Title: _____

(Attach Acknowledgment with Notary
Seal and Power of Attorney)

CONTRACTOR:

s/ _____

Name: _____

Title: _____

APPROVED AS TO FORM:

By: _____
Donald A. Larkin, City Attorney

Date: _____

END OF PERFORMANCE BOND

WARRANTY BOND

The City of Morgan Hill ("City") and _____ ("Contractor") have entered into a contract, dated _____, 20__ ("Contract") for work on the Sanitary Sewer Lift Stations J & W Rehabilitation Project ("Project"). The Contract is incorporated by reference into this Warranty Bond ("Bond").

1. **General.** Under this Bond, Contractor as principal and _____, its surety ("Surety"), are bound to City as obligee in the maximum amount of 50% of the final Contract Price ("Bond Sum").

2. **Warranty Period.** The Contract requires Contractor to guarantee its work and that of its Subcontractors on the Project, against defects in materials or workmanship which are discovered during the one (1) year period commencing with recordation of the Notice of Completion (the "Warranty Period").

3. **Surety's Obligations.** If Contractor faithfully carries out and performs its guarantee under the Contract, and, on due notice from City, repairs and make good at its sole expense any and all defects in materials and workmanship in the Project which are discovered during the Warranty Period, or if Contractor promptly reimburses City for all loss and damage that City sustains because of Contractor's failure to makes such repairs in accordance with the Contract requirements, then Surety's obligations under this Bond will be null and void. Otherwise, Surety's obligations will remain in full force and effect.

4. **Waiver.** Surety waives the provisions of Civil Code Sections 2819 and 2845.

5. **Notice.** Any notice to Surety may be given in the manner specified in the Contract and delivered or transmitted to Surety as follows:

Attn: _____
Address: _____
City/State/Zip: _____
Phone: _____
Fax: _____
Email: _____

6. **Law and Venue.** This Bond will be governed by California law, and any dispute pursuant to this Bond will be venued in the Superior Court of Santa Clara County, and no other place. Surety will be responsible for City's

attorneys' fees and costs in any action to enforce the provisions of this Bond.

7. Effective Date; Execution. This Bond is entered into and is effective on _____, 20__.

SURETY:

CONTRACTOR:

s/ _____

s/ _____

Name: _____

Name: _____

Title: _____

Title: _____

(Attach Acknowledgment with Notary Seal and Power of Attorney)

APPROVED AS TO FORM:

By: _____
Donald A. Larkin, City Attorney

Date: _____

END OF WARRANTY BOND

GENERAL CONDITIONS

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Article 1 Definitions

1.1 Definitions. The following definitions apply to all of the Contract Documents unless otherwise indicated. Defined terms and titles of documents are capitalized in the Contract Documents, with the exception of the words “day,” “furnish,” “including,” “install,” “work day” or “working day.”

Allowance means an amount included in the Bid Proposal for Work that may or may not be included in the Project, depending on conditions that will not become known until after bids are opened. If the Contract Price includes an Allowance and the cost of performing the Work covered by that Allowance is greater or less than the Allowance, the Contract Price will be increased or decreased accordingly.

Article, as used in these General Conditions, means a numbered Article of the General Conditions, unless otherwise indicated by the context.

Change Order means a written document duly approved and executed by City, which changes the scope of Work, the Contract Price, or the Contract Time.

City means the City of Morgan Hill, acting through its City Council, officers, employees, and authorized representatives.

City Engineer means the City Engineer for City and his or her authorized delegate(s) designated to oversee and manage the Project on City’s behalf.

Claim means a separate demand by Contractor for change in the Contract Time or Contract Price, that has previously been submitted to City in accordance with the requirements of the Contract Documents, and which has been rejected by City, in whole or in part; or a written demand by Contractor objecting to the amount of Final Payment.

Contract means the signed agreement between City and Contractor.

Contract Documents means, collectively, all of the documents listed as such in Section 2 of the Contract, including the Notice Inviting Bids; the Instructions to Bidders; addenda, if any; the Bid Proposal, and attachments thereto; the Contract; the notice of award and notice to proceed; the payment and performance bonds; the General Conditions; the Special Conditions; the Project Drawings and Specifications; any Change Orders; and any other documents expressly made part of the Contract Documents.

Contract Price means the total compensation to be paid to Contractor for performance of the Work, as set forth in the Contract and as amended by Change Order or adjusted for an Allowance. The Contract Price is not subject to adjustment due to inflation or due to the increased cost of labor, material, or equipment following submission of the Bid Proposal. The Contract Price is deemed to include all applicable federal, state, and local taxes

Contract Time means the number of calendar days for performance of the Work, as set forth in the Contract and as amended by Change Order.

Contractor means the individual, partnership, corporation, or joint-venture who has signed the Contract with City to perform the Work.

Day means a calendar day unless otherwise specified.

Design Professional means the licensed individual(s) or firm(s) retained by City to provide architectural or engineering services for the Project. If no Design Professional has been retained for this Project, any reference to Design Professional is deemed to refer to the Engineer.

Drawings means City-provided plans and graphical depictions of the Project requirements, and does not include Shop Drawings.

Engineer means the City Engineer for the City of Morgan Hill and his or her authorized delegee(s).

Final Completion means Contractor has fully completed all of the Work required by the Contract Documents, including all punch list items, any required commissioning, and has provided all required submittals, including the warranty bond, instructions and manuals, and as-built drawings to City's satisfaction.

Final Payment means payment to Contractor of the unpaid Contract Price, including release of undisputed retention, less amounts withheld pursuant to the Contract Documents, including liquidated damages, up to one hundred twenty five percent (125%) of the amount of any unreleased stop notice, amounts subject to setoff, up to one hundred fifty percent (150%) of any unresolved third-party claim for which Contractor is required to indemnify City, and up to one hundred fifty percent (150%) of any amount in dispute as authorized by Public Contract Code Section 7107.

Furnish means to purchase and deliver to the Worksite designated for installation.

Hazardous Materials means any substance or material identified now or in the future as hazardous under any federal, state, or local law or regulation, or any other substance or material that may be considered hazardous or otherwise subject to statutory or regulatory requirements governing handling, disposal, or cleanup.

Including, whether or not capitalized, means “including, but not limited to,” unless the context requires otherwise.

Inspector means the individual(s) or firm(s) retained by City to inspect the workmanship, materials, and manner of construction of the Project and its components to ensure compliance with the Contract Documents and all applicable codes, regulations, and permits.

Install means to fix in place for materials, and to fix in place and connect for equipment.

Project means the public works project referenced in the Contract.

Project Manager means the individual designated by City to oversee and manage the Project on City’s behalf and may include his or her authorized delegee(s) when the Project Manager is unavailable. If no Project Manager has been designated for this Project, any reference to Project Manager is deemed to refer to the Engineer.

RFI means a written request from Contractor for information from City or its Design Professional.

Section as used in these General Conditions, means a numbered Section of the General Conditions, unless otherwise indicated by the context.

Shop Drawings means drawings, plan details or other graphical depictions prepared by or on behalf of Contractor, and subject to City approval, which are

intended to provide details for fabrication, installation, and the like, of items required by or shown in the Drawings and Specifications.

Specifications means the technical, text specifications describing the Project requirements, which are prepared for and incorporated into this Project by or on behalf of City, and does not include the Contract, General Conditions or Special Conditions.

Subcontractor means an individual, partnership, corporation, or joint-venture retained by Contractor directly or indirectly through a subcontract to perform a specific portion of the Work. The term Subcontractor applies to subcontractors, suppliers, fabricators, and equipment lessors of all tiers, unless otherwise indicated by the context.

Technical Specifications means Specifications.

Work means all of the construction and services necessary or incidental to completing the Project in conformance with the requirements of the Contract Documents.

Work Day or Working Day, whether or not capitalized, means a weekday which is not a holiday observed by City.

Worksite means the place or places where the Work is performed.

Article 2 Roles and Responsibilities

2.1 Design Professional.

(A) **General.** Design Professional, as City's representative, is responsible for the overall design of the Project, and to the extent authorized by City, may act on City's behalf to ensure performance of the Work in compliance with the Contract Documents.

(B) **Interpretation.** Design Professional will decide all questions pertaining to interpretation of the Drawings or Specifications. The Design Professional's decision regarding interpretation of the Drawings or Specifications is final and conclusive.

2.2 Contractor.

(A) **General.** Contractor must provide all labor, materials, equipment and services necessary to perform and timely complete the Work in strict accordance with the Contract Documents, and in an economic and efficient manner in the best interests of City.

(B) **Responsibility for the Work.** Contractor is responsible for supervising and directing all aspects of the Work to facilitate the efficient and timely completion of the Work. Contractor is solely responsible for, and required to exercise full control over, construction means, methods, techniques, sequences, procedures, and coordination of all portions of the Work with that of all other Contractors and Subcontractors, except to the extent that the Contract Documents provide other specific instructions.

(C) **Project Administration.** Contractor must provide sufficient and competent administration, staff, and skilled workforce necessary to perform and timely complete the Work in accordance with the Contract Documents. Before starting the Work, Contractor must designate in writing and provide complete contact information, including phone numbers and email address, for the officer or employee in Contractor's organization who is to serve as Contractor's primary representative for the Project, and who has authority to act on Contractor's behalf. A Subcontractor may not serve as Contractor's primary representative.

(D) **On-Site Superintendent.** Contractor must, at all times during performance of the Work, provide a qualified and competent full-time superintendent, acceptable to City, and assistants, as necessary, who must be physically present at the Project site while any aspect of the Work is being performed. Failure to comply may result in temporary suspension of the Work, at Contractor's sole expense and with no extension of

Contract Time, until the superintendent is physically present to supervise the Work. Contractor must provide written notice to City, as soon as practicable, before replacing the superintendent.

(E) **Standards; Compliance.** Contractor must, at all times, ensure that the Work is performed in a good workmanlike manner following best practices and in full compliance with the Contract Documents and all applicable laws, regulations, codes, standards, and permits.

(F) **Responsible Party.** Contractor is solely responsible to City for the acts or omissions of any party or parties performing portions of the Work or providing equipment, materials or services for or on behalf of Contractor or its Subcontractors. If any person employed by Contractor fails or refuses to comply with the Engineer's directions regarding the performance of the Work, or is determined by the Engineer to be incompetent to perform the Work, or acts in a disorderly or improper manner at the Worksite, that person may be permanently dismissed from the Project at the request of the Engineer.

(G) **Correction of Defects.** Contractor must promptly correct, at Contractor's sole expense, any Work that is determined by City, Project Manager, or the Inspector to be deficient or defective in workmanship, materials, and equipment.

(H) **Contractor's Records.** Contractor must maintain all of its records relating to the Project in any form, including paper documents, photos, videos and electronic records. Project records subject to this provision include, but are not limited to, Project cost records and records relating to preparation of Contractor's bid.

(1) Contractor's cost records must include all supporting documentation, including original receipts, invoices, and payroll records, evidencing its direct costs to perform the Work, including, but not limited to, costs for labor, materials and equipment. Each cost record should include, at a minimum, a description of the expenditure with references to the applicable requirements of the Contract Documents, the amount actually paid, the date of payment, and whether the expenditure is part of the original Contract Price, related to an executed Change Order, or otherwise categorized by Contractor as extra work. Contractor's failure to comply with this provision as to any claimed cost operates as a waiver of any rights to recover the claimed cost.

(2) Contractor must continue to maintain its Project records in an organized manner for a period of four (4) years after City's

acceptance of the Project or following termination, whichever occurs first. Subject to prior notice to Contractor, City is entitled to inspect or audit any of Contractor's Project records relating to the Project or to investigate Contractor's plant or equipment during Contractor's normal business hours.

2.3 Subcontractors.

(A) **General.** All Work which is not performed by Contractor with its own forces must be performed by Subcontractors, subject to the fifty percent (50%) limitation set forth in the Instructions to Bidders. City reserves the right to approve or reject any and all Subcontractors proposed to perform the Work.

(B) **Contractual Obligations.** Contractor must require every Subcontractor to be bound to the provisions of the Contract Documents as they apply to the Subcontractor's portion(s) of the Work, and to likewise bind their subcontractors or suppliers. Nothing in these Contract Documents creates a contractual relationship between a Subcontractor and City, but City is deemed to be a third-party beneficiary of the contract between Contractor and each Subcontractor.

Copies of subcontracts must be available to the Engineer upon request. Before a Subcontractor commences Work on the Project, Contractor must provide the Engineer a written statement with the name of the Subcontractor, a description of each portion of the Work performed by the Subcontractor, and the percentage of the overall Work to be performed by the Subcontractor.

(C) **Termination.** If the Contract is terminated, each Subcontractor's agreement must be assigned by Contractor to City, subject to the prior rights of any surety, provided that City accepts the assignment by written notification, and assumes all rights and obligations of Contractor pursuant to each such subcontract agreement.

(D) **Substitution of Subcontractor.** If Contractor requests substitution of a listed Subcontractor under Public Contract Code Section 4107, Contractor is solely responsible for all costs City incurs in responding to the request, including legal fees and costs to conduct a hearing.

2.4 Coordination of Work.

(A) **Concurrent Work.** City reserves the right to perform or to have performed other work on or adjacent to the Project site while the Work is being performed. Contractor is responsible for coordinating its Work with other work being performed on or adjacent to the Project site, and must

avoid hindering, delaying, or interfering with the work of other contractors and subcontractors. To the full extent permitted by law, Contractor must hold harmless and indemnify City, Design Professional, and Project Manager against any and all claims arising from or related to Contractor's avoidable, negligent, or willful hindrance of, delay to, or interference with the work of another contractor or subcontractor.

(B) **Defects.** Before proceeding with any portion of the Work affected by the construction or operations of others, Contractor must give Project Manager prompt written notification of any defects Contractor discovers which will prevent the proper execution of the Work. Failure to give notice of any such known defects will be deemed acknowledgement by Contractor that the work of others is not defective and will not prevent the proper execution of the Work.

2.5 Submittals. Unless otherwise specified, Contractor must submit to Project Manager for review and approval, all schedules, Shop Drawings, samples, product data and similar submittals required by the Contract Documents, or upon request by Project Manager. Unless otherwise specified, all submittals, including requests for information (RFIs) are subject to the provisions of this Section.

(A) **General.** Contractor is responsible for ensuring that its submittals are accurate and conform to the Contract Documents.

(B) **Time and Manner of Submission.** Contractor must ensure that its submittals are prepared and delivered in a manner consistent with the current approved schedule for the Work and within the applicable time specified elsewhere in the Contract Documents, or if no time is specified, in such time and sequence so as not to delay the performance of the Work or completion of the Project.

(C) **Required Contents.** Each submittal must include the Project name and contact number, Contractor's name and address, the name and address of any Subcontractor or supplier involved with the submittal, the date, and references to applicable Specification section(s) and/or drawing and detail number(s).

(D) **Required Corrections.** If corrections are required, Contractor must promptly make and submit any required corrections in full conformance with the requirements of this Section.

(E) **Effect of Review and Approval.** Review and approval of a submittal by City will not relieve Contractor from complying with the requirements of the Contract Documents. Contractor is responsible for

any errors in any submittal, and review or approval of a submittal by City is not an assumption of risk or liability by City.

(F) **Enforcement.** Any Work performed or material used without prior approval of a required submittal will be performed at Contractor's risk, and Contractor may be required to bear the costs incident thereto, including the cost of removing and replacing such Work, repairs to other affected portions of the Work, and the cost of additional time or services required of the Design Professional, Project Manager, or Inspector.

(G) **Excessive RFIs.** RFIs will be considered excessive or unnecessary if the Engineer determines that the explanation or response to the RFI is clearly and unambiguously discernable in the Contract Documents. City's costs to review and respond to excessive or unnecessary RFIs may be deducted from payments otherwise due to Contractor.

Article 3 Contract Documents

3.1 Interpretation of Contract Documents.

(A) **Drawings and Specifications.** The Drawings and Specifications included in the Contract Documents are complementary. If Work is shown on one (1) but not on the other, Contractor must perform the Work as though fully described on both, consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results. The Drawings and Specifications are deemed to include and require everything necessary and reasonably incidental to completion of the Work, whether or not particularly mentioned or shown. Contractor must perform all work and services and supply all things reasonably related to and inferable from the Contract Documents. In the event of a conflict between the Drawings and Specifications, the Specifications will control.

(B) **Duty to Notify.** If Contractor becomes aware of any ambiguity, discrepancy, omission, or error in the Drawings or Specifications, Contractor must immediately notify the Design Professional and request clarification of such, by submitting a written request for information (RFI) in the manner specified by City. The Design Professional's clarifications or interpretations will be final and binding.

(C) **Figures and Dimensions.** Figures control over scaled dimensions.

(D) **Technical or Trade Terms.** Any terms that have well-known technical or trade meanings will be interpreted in accordance with those

meanings, unless otherwise specifically defined in the Contract Documents.

(E) **Measurements.** Contractor must verify all relevant measurements at the Worksite before ordering any material or performing any Work, and will be responsible for the correctness of those measurements.

3.2 Order of Precedence. Information included in one (1) Contract Document but not in another will not be considered a conflict or inconsistency. Unless otherwise specified in the Special Conditions, in case of any conflict or inconsistency among the Contract Documents, the following order of precedence will apply, beginning from highest to lowest:

- (A) Change Orders;
- (B) Addenda;
- (C) Contract;
- (D) Notice to Proceed;
- (E) Notice of Award;
- (F) Special Conditions;
- (G) General Conditions;
- (H) Payment and Performance Bonds;
- (I) Specifications;
- (J) Drawings;
- (K) Contractor's Bid Proposal and attachments;
- (L) Notice Inviting Bids;
- (M) Instructions to Bidders; and
- (N) Any documents prepared by and on behalf of a third party, that were not prepared specifically for this Project, e.g., Caltrans Standard Specifications or Caltrans Special Provisions.

3.3 Caltrans Standard Specifications. Any reference to or incorporation of the Standard Specifications of the State of California, Department of Transportation ("Caltrans"), including "Standard Specifications," "Caltrans Specifications," "State Specifications," or "CSS," means the most current edition of Caltrans' Standard Specifications, unless otherwise specified ("Standard Specifications"), including the most current amendments as of the date that Contractor's bid was submitted for this Project. The following provisions apply to use of or reference to the Standard Specifications:

(A) **Limitations.** None of the "General Provisions" of the Standard Specifications, i.e., Sections 1 through 9, applies to these Contract Documents with the exception of any specific provisions, if any, which are expressly stated to apply to these Contract Documents.

(B) **Conflicts or Inconsistencies.** If there is a conflict or inconsistency between any provision in the Standard Specifications and a provision of

these Contract Documents, as determined by City, the provision in the Contract Documents will govern.

(C) **Meanings.** Terms used in the Standard Specifications are to be interpreted as follows:

(1) Any reference to the “Engineer” is deemed to mean the City Engineer.

(2) Any reference to the “Special Provisions” is deemed to mean the Special Conditions.

(3) Any reference to the “Department” or “State” is deemed to mean City.

3.4 For Reference Only. Contractor is responsible for the careful review of any document, study, or report appended to the Contract Documents solely for informational purposes and identified as “For Reference Only.” Nothing in any document, study, or report so appended and identified is intended to supplement, alter, or void any provision of the Contract Documents. However, Contractor is advised that City or its representatives may be guided by information or recommendations included in such reference documents, particularly when making determinations as to the acceptability of proposed materials, methods, or changes in the Work. Contractor must promptly notify City of any perceived or actual conflict between the Contract Documents and any document provided For Reference Only.

Article 4 Bonds, Indemnity, and Insurance

4.1 Payment and Performance Bonds. Within ten (10) days following issuance of the notice of award, Contractor is required to provide a payment bond and a performance bond, each in the penal sum of not less than one hundred percent (100%) of the Contract Price, using the bond forms included with the Contract Documents. Each bond must be issued by a surety admitted in California. If an issuing surety cancels the bond or becomes insolvent, within seven (7) days following written notice from City, Contractor must substitute a surety acceptable to City. If Contractor fails to substitute an acceptable surety within the specified time, City may, at its sole discretion, withhold payment from Contractor until the surety is replaced to City’s satisfaction, or terminate the Contract for default.

4.2 Indemnity. To the fullest extent permitted by law, Contractor must indemnify, defend, and hold harmless City, its agents and consultants, and Design Professional (individually, an “Indemnatee,” and collectively the

“Indemnitees”) from and against any and all liability, loss, damage, claims, expenses (including, without limitation, attorney fees, expert witness fees, paralegal fees, and fees and costs of litigation or arbitration) (collectively, “Liability”) of every nature arising out of or in connection with the acts or omissions of Contractor, its employees, Subcontractors, representatives, or agents, in bidding or performing the Work or its failure to comply with any of its obligations under the Contract, except such Liability caused by the active negligence, sole negligence, or willful misconduct of an Indemnitee. This indemnity requirement applies to any Liability arising from alleged defects in the content or manner of submission of Contractor’s bid for the Contract. Contractor’s failure or refusal to timely accept a tender of defense pursuant to this provision will be deemed a material breach of this Contract. City will timely notify Contractor upon receipt of any third-party claim relating to the Contract, as required by Public Contract Code Section 9201.

4.3 Insurance. No later than ten (10) days following issuance of the notice of award, Contractor is required to procure and provide proof of the insurance coverage required by this section in the form of certificates and endorsements. The required insurance must cover the activities of Contractor and its Subcontractors relating to or arising from the performance of the Work, and must remain in full force and effect at all times during the period covered by the Contract until the date of recordation of the notice of completion. The coverages may be arranged under a single policy for the full limits required or by a combination of underlying policies with the balance provided by excess or “umbrella” policies, provided each such policy complies with the requirements set forth herein. All required insurance must be issued by a company licensed to do business in the State of California, and each such insurer must have an A.M. Best’s financial strength rating of “A” or better and a financial size rating of “VIII” or better. If Contractor fails to provide any of the required coverage in full compliance with the requirements of the Contract Documents, City may, at its sole discretion, purchase such coverage at Contractor’s expense and deduct the cost from payments due to Contractor, or terminate the Contract for default. Contractor further understands that City reserves the right to modify the insurance requirements set forth herein, with thirty (30) days’ notice provided to Contractor, at any time as deemed necessary to protect the interests of City.

(A) **Policies and Limits.** The following insurance policies and limits are required for this Contract unless otherwise specified in the Special Conditions:

- (1) **Commercial General Liability Insurance (“CGL”).**
Contractor shall maintain CGL and must include coverage for

liability arising from Contractor's or its Subcontractor's acts or omissions in the performance of the Work against claims and liabilities for personal injury, death, or property damage providing protection in the minimum amount of: (i) two million dollars (\$2,000,000.00) combined single limit and a general aggregate limit of four million dollars (\$4,000,000.00), or (ii) the maximum amount of such insurance available to Contractor under Contractor's combined insurance policies (including any excess or "umbrella" policies), whichever is greater.

- a. CGL policy may not exclude explosion, collapse, underground excavation hazard, or removal of lateral support.
- b. CGL policy must include contractor's protected coverage, blanket contractual, and completed operations.

(2) **Workers' Compensation Insurance and Employer's Liability:** Contractor shall maintain Workers Compensation coverage, as required by law. The policy must comply with the requirements of the California Workers' Compensation Insurance and Safety Act and provide protection in the minimum amount of: (i) One Million Dollars (\$1,000,000.00) for any one accident or occurrence, or (ii) the maximum amount of such insurance available to Contractor under Contractor's combined insurance policies (including any excess or "umbrella" policies), whichever is greater.. If Contractor is self-insured, Contractor must provide its Certificate of Permission to Self-Insure, duly authorized by the Department of Industrial Relations.

(3) **Automobile Liability:** Contractor shall maintain Automobile Liability covering all owned, non-owned and hired automobiles (if Contractor does not own automobiles, then Contractor shall maintain Hired/Non-owned Automobile Liability) against claims and liabilities for personal injury, death, or property damage providing protection in the minimum amount of: (i) One Million Dollars (\$1,000,000.00) combined single limit, or (ii) the maximum amount of such insurance available to Contractor under Contractor's combined insurance policies (including any excess or "umbrella" policies), whichever is greater.

(4) **Pollution (Environmental) Liability:** Because the performance of Contractor's work or service under this Contract involves hazardous materials, contaminated soil disposal, and/or a risk of accidental release of fuel oil, chemicals or other

toxic gases or hazardous materials, Contractor shall procure and maintain Pollution Liability covering Contractor's liability for bodily injury, property damage and environmental damage resulting from pollution and related cleanup costs arising out of the work or services to be performed under this Contract. Coverage shall be provided for both work performed on site, as well as during the transport of hazardous materials. Such coverage shall be in the minimum amount of: (i) One Million Dollars (\$1,000,000.00) for any one accident or occurrence, or (ii) the maximum amount of such insurance available to Contractor under Contractor's combined insurance policies (including any excess or "umbrella" policies), whichever is greater.

(5) **Professional Liability:**

- a. If the performance of Contractor's work or service under this Contract involves professional and/or technical services (examples include, but are not limited to, architects, engineers, land surveyors, legal services, and appraisers), Contractor shall procure and maintain either a claims made or occurrence Errors and Omission liability insurance in the minimum amount of: (i) One Million Dollars (\$1,000,000.00) each claim, or (ii) the maximum amount of such insurance available to Contractor under Contractor's combined insurance policies (including any excess or "umbrella" policies), whichever is greater. Further, if Contractor maintains a claims-made policy, Contractor shall provide written evidence of such insurance to City for at least five (5) years after the completion of work performed under this Contract.

(B) **Required Endorsements.** Contractor must provide proof of the following endorsements, listed for each policy for which endorsements are required, as outlined below:

(1) For all Policies except Professional Liability:

- a. "Waiver of Subrogation" endorsements providing that the carrier agrees to waive any right of subrogation it may have against the City of Morgan Hill and the City's elected or appointed officials, boards, agencies, officers, agents, employees, and volunteers.

(2) General Liability Policy:

- a. "Additionally Insured" endorsements naming the City of Morgan Hill, its elected or appointed officials, boards, agencies, officers, agents, employees, and volunteers as additional insureds;
- b. "Primary and Non-Contributing" endorsements stating that the policy is primary non-contributing;
- c. "Separation of Insureds" endorsements stating that the inclusion of more than one insured will not operate to impair the rights of one insured against another, and the coverages afforded will apply as though separate policies have been issued to each insured.

(C) **Subcontractors.** Contractor must ensure that each Subcontractor is required to maintain the same insurance coverage required under this Section 4.3, with respect to its performance of Work on the Project, including those requirements related to the additional insureds and waiver of subrogation.

(D) **Certificates.** Contractor must furnish City with copies of all policies or certificates as outlined herein, whether new or modified, promptly upon receipt. No policy subject to Contractor's Contract with City shall be reduced, canceled, allowed to expire, or materially changed except after thirty (30) days' notice by the insurer to City, unless due to non-payment of premiums, in which case ten (10) days written notice must be made to City. Certificates, including renewal certificates, may be mailed electronically to riskmgmt@morganhill.ca.gov or delivered to the Certificate Holder address as follows:

City of Morgan Hill
Attn: Risk Management
17575 Peak Avenue
Morgan Hill, CA 95037

4.4 Warranty Bond. As a condition precedent to Final Completion, Contractor must submit a warranty bond, using the form provided by City, to guarantee its Work as specified in Article 11, Completion and Warranty Procedures. The warranty bond must be issued by a surety admitted in California for fifty percent (50%) of the final Contract Price or as otherwise specified in the Contract Documents. If an issuing surety cancels the bond or becomes insolvent, within seven (7) days following written notice from City, Contractor must substitute a surety acceptable to City.

Article 5 Contract Time

5.1 Time is of the Essence. Time is of the essence in Contractor's performance and completion of the Work, and Contractor must diligently prosecute the Work and complete it within the Contract Time.

(A) **General.** Contractor must commence the Work on the date indicated in the notice to proceed, and must fully complete the Work, in strict compliance with all requirements of the Contract Documents, and within the Contract Time.

(B) **Rate of Progress.** Contractor and its Subcontractors must, at all times, provide workers, materials, and equipment sufficient to maintain the rate of progress necessary to ensure full completion of the Work within the Contract Time. If City determines that Contractor is failing to prosecute the Work at a sufficient rate of progress, City may, in its sole discretion, direct Contractor to provide additional workers, materials, or equipment, or to work additional hours or days without additional cost to City, in order to achieve a rate of progress satisfactory to City. If Contractor fails to comply with City's directive in this regard, City may, at Contractor's expense, separately contract for additional workers, materials, or equipment or use City's own forces to achieve the necessary rate of progress. Alternatively, City may terminate the Contract based on Contractor's default.

5.2 Schedule Requirements. All schedules must be prepared using standard scheduling software acceptable to City, and must provide schedules in electronic and paper form as requested.

(A) **As-Planned (Baseline) Schedule.** Within fifteen (15) calendar days following issuance of the notice of award (or as otherwise specified in the Special Conditions), Contractor must submit to City for review and approval an as-planned (baseline) schedule showing in detail how Contractor plans to perform and fully complete the Work within the Contract Time using critical path methodology. The as-planned schedule must include the work of all trades required for the Work, and must be sufficiently comprehensive and detailed to enable progress to be monitored on a day-by-day basis. For each activity, the as-planned schedule must be dated, provided in the format specified in the Contract Documents or as required by City, and must include, at a minimum, a description of the activity, the start and completion dates, and the duration.

(B) **Progress Schedules.** Contractor must submit an updated progress schedule and three (3) week look-ahead schedule, in the format specified by City, for review and approval with each application for a progress payment. The progress schedule must show how the actual progress of the Work to date compared to the as-planned schedule, and must identify any actual or potential impacts to the critical path.

(C) **Recovery Schedule.** If City determines that the Work is more than one (1) week behind schedule, within seven (7) days following written notice of such determination, Contractor must submit a recovery schedule, showing how Contractor intends to perform and complete the Work within the Contract Time, based on actual progress to date.

(D) **Effect of Approval.** Contractor and its Subcontractors must perform the Work in accordance with the most current approved schedule unless otherwise directed by City. City approval of a schedule does not operate to extend the time for completion of the Work or any component of the Work, and will not affect City's right to assess liquidated damages for Contractor's unexcused delay in completing the Work within the Contract Time.

(E) **Posting.** Contractor must at all times maintain a copy of the most current approved progress or recovery schedule posted prominently in its on-site office.

(F) **Reservation of Rights.** City reserves the right to direct the sequence in which the Work must be performed or to make changes in the sequence of the Work in order to facilitate the performance of work by City or others, or to facilitate City's use of its property. The Contract Time or Contract Price may be adjusted to the extent such changes in sequence actually increase or decrease Contractor's time or cost to perform the Work.

(G) **Authorized Working Days and Times.** Contractor is limited to working Monday through Friday, excluding City of Morgan Hill-observed holidays, during City's normal business hours, except as expressly provided in the Special Conditions, or as authorized in writing by City. City reserves the right to charge Contractor for additional costs incurred by City due to Work performed on days or during hours not expressly authorized in these Contract Documents, including reimbursement of costs incurred for inspection, testing, and construction management services.

5.3 Delay and Extensions of Contract Time.

(A) **Excusable Delay.** The Contract Time may be extended if Contractor encounters an unavoidable delay in completing the Work within the Contract Time due to causes completely beyond Contractor's control, and which Contractor could not have avoided or mitigated through planning, foresight, and diligence ("Excusable Delay"). Grounds for Excusable Delay may include fire, earthquake, acts of terror or vandalism, epidemic, unforeseeable adverse government actions, unforeseeable actions of third parties, encountering unforeseeable hazardous materials,

unforeseeable site conditions, suspension for convenience under Article 13, or unusually severe weather.

(B) **Non-Excusable Delay.** Excusable Delay does not include delay that is concurrent with non-Excusable Delay, and does not include delay caused by:

- (1) weather conditions which are normal for the location of the Project, as determined by reliable records, including monthly rainfall averages, for the preceding ten (10) years;
- (2) Contractor's failure to order equipment and materials sufficiently in advance of the time needed for timely completion of the Work;
- (3) Contractor's failure to provide adequate notification to utility companies for connections or services necessary for the timely performance and completion of the Work;
- (4) foreseeable conditions Contractor could have ascertained from reasonably diligent inspection of the Worksite or review of the Contract Documents; or
- (5) Contractor's financial inability to perform the Work, including insufficient funds to pay its Subcontractors or suppliers.

(C) **Request for Extension of Contract Time.** A request for an extension of time and associated delay costs must be submitted in writing to City within ten (10) calendar days of the date the delay is first encountered, even if the duration of the delay is not yet known at that time, or will be deemed waived. In addition to complying with the requirements of this Article 5, the request must be submitted in compliance with the Change Order request procedures in Article 6, below. Strict compliance with these requirements is necessary to ensure that any delay or delay costs may be mitigated as soon as possible, and to facilitate cost-efficient administration of the Project and timely performance of the Work. Any request for an extension of time or delay costs that does not strictly comply with the requirements of Article 5 and Article 6 will be deemed waived.

- (1) **Required Contents.** The request must include a detailed description of the cause(s) of the delay, and must also describe the measures that Contractor has taken to mitigate the delay and/or its effects, including efforts to mitigate the cost impact of the delay, e.g., by workforce management, change in sequencing, etc. If the delay is still ongoing at the time the request is submitted, the

request should also include Contractor's plan for continued mitigation of the delay or its effects.

(2) *Delay Days and Costs.* The request must specify the number of days of Excusable Delay claimed, or provide a realistic estimate if the duration of the delay is not yet known. The request must specify the amount of any delay-related costs that are claimed, or provide a realistic estimate if the amount is not yet known. Any estimate of delay duration or cost must be updated in writing and submitted with all required supporting documentation as soon as the actual time and cost is known.

(3) *Supporting Documentation.* The request must also include any and all supporting documentation necessary to evidence the delay and its actual impacts, including schedule and cost impacts, including a time impact analysis using critical path methodology, and demonstrating unavoidable delay to Final Completion. The time impact analysis must be submitted in a form or format acceptable to City.

(4) *Burden of Proof.* Contractor has the burden of proving 1) that the delay was an Excusable Delay, as defined above, 2) that Contractor has made reasonable efforts to mitigate the delay and its schedule and cost impacts, 3) that the delay will unavoidably result in delaying Final Completion, and 4) that any delay costs claimed by Contractor were actually incurred and were reasonable under the circumstances.

(5) *Recoverable Costs.* If Contractor is granted an extension of time for Excusable Delay, recompense for delay costs will be limited to actual, direct, reasonable, and substantiated costs, and will not include home office overhead, or markup for overhead and profit.

(6) *Legal Compliance.* Nothing in this provision is intended to require the waiver, alteration, or limitation of the applicability of Public Contract Code Section 7102.

(7) *No Waiver.* Any grant of an extension of time or delay costs due to an Excusable Delay will not operate as a waiver of City's right to assess liquidated damages for unexcused delay.

(8) *Dispute Resolution.* In the event of a dispute over entitlement to an extension of time or delay costs, Contractor may not stop working pending resolution of the dispute, but must continue to comply with its duty to diligently prosecute the performance and

timely completion of the Work. Contractor's sole recourse for an unresolved dispute based on City's rejection of a Change Order request for an extension of time or delay costs is to comply with the Dispute Resolution provisions set forth in Article 12, below.

5.4 Liquidated Damages. It is expressly understood that if Final Completion is not achieved within the Contract Time, City will suffer damages which are difficult to determine and accurately specify. Pursuant to Public Contract Code section 7203, if Contractor fails to achieve Final Completion within the Contract Time, City will charge Contractor in the amount specified in the Contract for each day that Final Completion is delayed beyond the Contract Time, as liquidated damages and not as a penalty.

(A) **Liquidated Damages.** Liquidated damages will not be assessed for any Excusable Delay, as set forth above.

(B) **Milestones.** Liquidated damages will also be separately assessed for failure to meet milestones specified elsewhere in the Contract Documents.

(C) **Setoff.** City is entitled to set off the amount of liquidated damages assessed against any payments otherwise due to Contractor, including setoff against release of retention. If there are insufficient Contract funds remaining to cover the full amount of liquidated damages assessed, City is entitled to recover the balance from Contractor or its performance bond surety.

(D) **Occupancy or Use.** Occupancy or use of the Project in whole or in part prior to Final Completion does not constitute City's acceptance of the Project and will not operate as a waiver of City's right to assess liquidated damages for Contractor's unexcused delay in achieving Final Completion.

Article 6 Contract Modification

6.1 Changes in Work. City reserves the right to make changes in the Work without invalidating the Contract. City may direct or Contractor may request changes in the Work, and any such changes will be formalized in a Change Order, which may include commensurate changes in the Contract Price or Contract Time as applicable. Contractor must promptly comply with City-directed changes in the Work in accordance with the intent of the original Contract Documents, even if Contractor and City have not yet reached agreement as to adjustments to the Contract Price or Contract Time.

(A) **City-Directed Change.** In the event of a dispute over entitlement to or the amount of a change in Contract Time or a change in Contract Price related to an City-directed change, Contractor must perform the Work as directed and may not delay its work or cease work pending resolution of the dispute, but must continue to comply with its duty to diligently prosecute the performance and timely completion of the Work, including the Work in dispute.

(B) **Contractor's Obligations.** In the event that City and Contractor dispute whether a portion or portions of the Work are already required by the Contract Documents as opposed to changed or extra Work, Contractor must perform the Work as directed and may not delay its Work or cease Work pending resolution of the dispute, but must continue to comply with its duty to diligently prosecute the performance and timely completion of the Work, including the Work in dispute.

(C) **Remedy for Non-Compliance.** Contractor's failure to promptly comply with an City-directed change is deemed a material breach of the Contract, and in addition to all other remedies available to it, City may, at its sole discretion, hire another contractor or use its own forces to complete the disputed Work at Contractor's sole expense, and may deduct the cost from the Contract Price.

(D) **Dispute Resolution.** Contractor's sole recourse for an unresolved dispute related to changes in the Work is to comply with the dispute resolution provisions set forth in Article 12, below.

6.2 Contractor Change Order Requests. Contractor must submit a request or proposal for a change in the Work or a change in the Contract Price or Contract Time as a written Change Order request or proposal.

(A) **Time for Submission.** Any request for a change in the Contract Price must be submitted in writing to Project Manager within ten (10) calendar days of the date that Contractor first encounters the circumstances, information or conditions giving rise to the Change Order request, even if the total amount of the requested change in the Contract Price or impact on the Contract Time is not yet known at that time.

(B) **Required Contents.** Any Change Order request or proposal submitted by Contractor must include a complete breakdown of actual or estimated costs and credits, and must itemize labor, materials, equipment, taxes, insurance, and subcontract amounts. Any estimated cost must be updated in writing as soon as the actual amount is known.

(C) **Required Documentation.** All claimed costs must be fully documented, and any related request for an extension of time or delay-related costs must be included at that time and in compliance with the requirements of Article 5 of the General Conditions.

(D) **Required Form.** Contractor must use City's form(s) for submitting all Change Order requests or proposals, unless otherwise specified by City.

(E) **Certification.** All Change Order requests must be signed by Contractor and must include the following certification:

"The undersigned Contractor certifies under penalty of perjury that its statements and representations in this Change Order request are true and correct. Contractor warrants that this Change Order request is comprehensive and complete, and agrees that any costs, expenses, or time extension request not included herein is deemed waived. Contractor understands that submission of claims which have no basis in fact or which Contractor knows to be false may violate the False Claims Act, as set forth in Government Code Sections 12650 et seq."

6.3 Adjustments to Contract Price. The amount of any increase or decrease to the Contract Price will be determined based on one (1) of the following methods in the order provided:

(A) **Unit Pricing.** Amounts previously provided by Contractor in the form of unit prices, either in a bid schedule or schedule of values, will apply if unit pricing has previously been provided in Contractor's accepted bid schedule or schedule of values for the affected Work;

(B) **Lump Sum.** A mutually agreed upon lump sum;

(C) **Time and Materials.** On a time and materials basis, which may include a not-to-exceed limit, calculated as the total of the following sums:

(1) All direct labor costs plus fifteen percent (15%) for overhead and profit;

(2) All direct material costs, including sales tax, plus fifteen percent (15%) for overhead and profit;

(3) All direct plant and equipment rental costs, plus fifteen percent (15%) for overhead and profit;

(4) All direct subcontract costs plus ten percent (10%) for overhead and profit; and

(5) Increased bond or insurance premium costs computed at one and one half percent (1½%) of total of the previous four (4) sums.

6.4 Unilateral Change Order. If City disagrees with the amount of compensation or extension of time that Contractor has requested, City may elect to issue a unilateral Change Order, directing performance of the Work, and authorizing a change in the Contract Price or Contract Time in the amount City believes is merited. Contractor's sole recourse to dispute the terms of a unilateral Change Order is to submit a timely Claim pursuant to Article 12, below.

6.5 Non-Compliance Deemed Waiver. Contractor waives its entitlement to any increase in the Contract Price or Contract Time if Contractor fails to fully comply with the provisions of this Article. Contractor will not be paid for unauthorized extra work.

Article 7 General Construction Provisions

7.1 Permits and Taxes.

(A) **General.** Contractor must obtain and pay for any and all permits, fees, or licenses required to perform the Work, unless otherwise indicated in the Contract Documents. Contractor must cooperate with and provide notifications to government agencies with jurisdiction over the Project, as may be required. Contractor must provide City with copies of all notices, permits, licenses, and renewals required for the Work.

(B) **Federal Excise Tax.** Contractor must pay for all taxes on labor, material and equipment, except Federal Excise Tax to the extent that City is exempt from Federal Excise Tax.

7.2 Temporary Facilities. Contractor must provide, at Contractor's sole expense, any and all temporary facilities, including onsite office, sanitary facilities, storage, scaffolds, barricades, walkways, and any other temporary structure required to safely perform the Work along with any utility services incidental thereto.

(A) **Standards.** Such structures must be safe and adequate for the intended use, and installed and maintained in accordance with all applicable federal, state, and local laws, codes, and regulations.

(B) **Removal and Repair.** Contractor must promptly remove all such temporary facilities when they are no longer needed or upon completion of the Work, whichever comes first. Contractor must promptly repair any damage to City's property caused by the installation, use, or removal of the temporary facilities, and must promptly restore the property to its original or intended condition.

(C) **Additional Requirements.** Additional provisions pertaining to temporary facilities may be included in the Specifications or Special Conditions.

7.3 Signs. No signs may be displayed on or about City's property, except signage which is required by law or by the Contract Documents, without City's prior written approval as to content, size, design, and location.

7.4 Protection of Work and Property.

(A) **General.** Contractor is responsible at all times for protecting the Work and materials and equipment to be incorporated into the Work from damage until the Notice of Completion has been recorded. Except as specifically authorized by City, Contractor must confine its operations to the area of the Project site indicated in the Drawings. Contractor is liable for any damage caused to City's real or personal property, the real or personal property of adjacent property owners, or the work or personal property of other contractors working for City.

(B) **Unforeseen Conditions.** If Contractor encounters facilities, utilities, or other unknown conditions not shown on or reasonably inferable from the Drawings or apparent from inspection of the Project site, Contractor must promptly notify Project Manager, and must avoid taking any action which could cause damage to the facilities or utilities pending further direction from Project Manager. If Project Manager's subsequent direction to Contractor affects Contractor's cost or time to perform the Work, Contractor may submit a Change Order request as set forth in Article 6, above.

(C) **Support; Adjacent Properties.** Contractor must provide, install, and maintain all shoring, bracing, underpinning, etc., necessary to provide support to City's property and adjacent properties and improvements thereon. Contractor must provide notifications to adjacent property owners as may be required by law.

7.5 Noninterference. Contractor must take reasonable measures to avoid interfering with City's use of its property at or adjacent to the Project site, including use of roadways, entrances, parking areas, walkways, and structures.

7.6 Materials and Equipment.

(A) **General.** Unless otherwise specified, all materials and equipment required for the Work must be new and of the best grade for the intended purpose, and furnished in sufficient quantities to ensure the proper and expeditious performance of the Work. Unless otherwise specified, all materials and equipment required for the Work are deemed to include all components required for complete installation and intended operation, and must be installed in accordance with the manufacturer's recommendation. Contractor is responsible for all shipping, handling, and storage costs associated with the materials and equipment required for the Work, and is responsible for protecting the Work and all of the required materials, supplies, tools and equipment at Contractor's sole cost until City accepts the Project.

(B) **City-Provided.** If the Work includes installation of materials or equipment to be provided by City, Contractor is solely responsible for the proper examination, handling, storage, and installation of such items in accordance with the Contract Documents. Contractor must promptly notify City of any defects discovered in City-provided materials or equipment. Contractor is solely responsible for any loss of or damage to such items which occurs while the items are in Contractor's custody and control, the cost of which may be offset from the Contract Price and deducted from any payment(s) due to Contractor.

(C) **Intellectual Property Rights.** Contractor must, at its sole expense, obtain any authorization required for use of patented or copyright protected materials, equipment, devices or processes that are incorporated into the Work. Contractor's indemnity obligation in Article 4, applies to any claimed violation of intellectual property rights in violation of this provision.

7.7 Substitutions.

(A) **"Or Equal."** Any specification designating a material, product, thing, or service by specific brand or trade name, followed by the words "or equal," is intended only to indicate quality and type of item desired, and Contractor may request use of any equal material, product, thing, or service.

(B) **Request for Substitution.** A request for substitution must be submitted to Project Manager for approval within the applicable time period provided in the Contract Documents. If no time period is specified, the substitution request may be submitted any time within thirty five (35)

days after the date of award of the Contract, or sufficiently in advance of the time needed to avoid delay of the Work, whichever is earlier.

(C) **Substantiation.** All data substantiating the proposed substitute as an “equal” item must be submitted with the written request for substitution. Contractor’s failure to timely provide necessary substantiation is ground for rejection of the proposed substitution, without further review.

(D) **Burden of Proving Equality.** Contractor has the burden of proving the equality of the proposed substitution. City has sole discretion to determine whether a proposed substitution is “equal,” and City’s determination is final.

(E) **Approval or Rejection.** If the proposed substitution is approved, Contractor is solely responsible for any additional costs associated with the substituted item(s). If the proposed substitution is rejected, Contractor must, without delay, install the item specified.

(F) **Contractor’s Obligations.** City’s review of a proposed substitution will not relieve Contractor from any of its obligations under the Contract Documents. In the event Contractor makes an unauthorized substitution, Contractor will be solely responsible for all resulting cost impacts, including the cost of removal and replacement and the impact to other design elements.

7.8 Testing and Inspection.

(A) **General.** All materials, equipment, and workmanship used in the Work are subject to inspection by Inspector at all times and locations during construction and/or fabrication. All manufacturers’ application or installation instructions must be provided to the Inspector at least ten (10) days prior to the first such application or installation. Contractor must, at all times, make the Work available for inspection.

(B) **Scheduling and Notification.** Contractor must schedule all tests required by the Contract Documents in time to avoid any delay to the progress of the Work. Contractor must provide timely notice to all necessary parties as specified in the Contract Documents.

(C) **Responsibility for Costs.** City will bear the initial cost of testing to be performed by independent testing consultants retained by City, subject to the following exceptions:

- (1) Contractor will be responsible for the costs of any subsequent tests which are required to substantiate compliance with the Contract Documents, and any associated remediation costs.

(2) Contractor will be responsible for inspection costs, at City's established rates, for inspection time lost because the Work is not ready or Contractor fails to appear for a scheduled inspection.

(3) In addition, if any portion of the Work which is subject to testing is covered or concealed by Contractor prior to testing, Contractor will bear the cost of making that portion of the Work available for the testing required by the Contract Documents, and any associated repair or remediation costs.

(D) **Contractor's Obligations.** Any Work that fails to comply with the requirements of the Contract Documents must be promptly repaired, replaced, or corrected by Contractor, at Contractor's sole expense, even if that Work was previously inspected or included in a progress payment. Contractor is solely responsible for any delay occasioned by remediation of noncompliant Work. Inspection of the Work does not in any way relieve Contractor of its obligations to perform the Work as specified.

(E) **Distant Locations.** If required off-site testing or inspection must be conducted at a location more than 100 miles from the Project site, Contractor is solely responsible for the additional travel costs required for testing and/or inspection at such locations.

(F) **Final Inspection.** The provisions of this Section 7.8 apply to final inspection under Article 11, Completion and Warranty Provisions.

7.9 Clean up. Contractor must regularly remove debris and waste materials and maintain the Worksite in clean and neat condition.

(A) **General.** Prior to discontinuing work in an area, Contractor must clean the area and remove all rubbish along with its construction equipment, tools, machinery, waste and surplus materials. Contractor must, at all times, minimize and confine dust and debris resulting from construction activities.

(B) **Completion.** At the completion of the Work, Contractor must remove from the Worksite all of its equipment, tools, surplus materials, waste materials and debris. Before demobilizing from the Worksite, Contractor must ensure that all surfaces are cleaned, sealed, waxed, or finished as applicable, and that all marks, stains, paint splatters, and the like have been properly removed from the completed Work and the surrounding areas.

(C) **Non-Compliance.** If Contractor fails to commence compliance with its cleanup obligations within two (2) business days following written

notification from City or its representative, City may undertake appropriate cleanup measures without further notice and the cost will be deducted from any amounts due or to become due Contractor.

7.10 Instructions and Manuals. Contractor must provide three (3) copies each of all instructions and manuals required by the Contract Documents, unless otherwise specified. These must be complete as to drawings, details, parts lists, performance data, and other information that may be required for City to easily maintain and service the materials and equipment installed for this Project.

(A) **Submittal Requirements.** All manufacturers' application or installation instructions must be provided to the Inspector at least ten (10) days prior to the first such application. The instructions and manuals, along with any required guarantees, must be delivered to City for review.

(B) **Instruction of Personnel.** Contractor or its Subcontractors must instruct City's personnel in the operation and maintenance of any complex equipment as a condition precedent to Final Completion, if required in the Contract Documents.

7.11 As-built Drawings. Contractor and its Subcontractors must maintain on the Worksite a separate complete set of the Drawings which will be used solely for the purpose of recording changes made in any portion of the Work in order to create accurate record drawings at the end of the Project.

(A) **Duty to Update.** The as-built drawings must be updated as changes occur, on a daily basis if necessary. Progress payments may be delayed, in whole or in part, until the as-built drawings are brought up to date to the satisfaction of City. Actual locations to scale must be identified on the as-built drawings for all runs of mechanical and electrical work, including all site utilities, etc., installed underground, in walls, floors, or otherwise concealed. Deviations from the original Drawings must be shown in detail. The location of all main runs, whether piping, conduit, ductwork, drain lines, etc., must be shown by dimension and elevation.

(B) **Final Completion.** Contractor must verify that all changes in the Work are depicted in the as-built drawings and must deliver the complete set of as-built drawings to City for review and approval as a condition precedent to Final Completion.

7.12 Existing Utilities. As required by Government Code Section 4215, if, during the performance of the Work, Contractor discovers utility facilities not identified by City in the Contract Documents, Contractor must immediately provide written notice to City and the utility. City assumes responsibility for the timely removal, relocation, or protection of existing

main or trunkline utility facilities located on the Project site, if those utilities are not identified in the Contract Documents. Contractor will be compensated in accordance with the provisions of the Contract Documents for the costs of locating, repairing damage not due to Contractor's failure to exercise reasonable care, and removing or relocating such utility facilities not indicated in the Drawings or Specifications with reasonable accuracy, and for equipment on the Project necessarily idled during such work. Contractor will not be assessed liquidated damages for delay in completion of the Work, to the extent such delay was caused by City's failure to provide for removal or relocation of the utility facilities.

7.13 Notice of Excavation. Government Code Section 4216.2, requires that except in an emergency, Contractor must contact the appropriate regional notification center, or Underground Services Alert at 800-642-2444 (for Northern California), at least two (2) working days, but not more than fourteen (14) calendar days before starting any excavation if the excavation will be conducted in an area that is known, or reasonably should be known, to contain subsurface installations, and if practical, Contractor must delineate with white paint or other suitable markings the area to be excavated.

7.14 Trenching and Excavations.

(A) ***Duty to Notify.*** Contractor must promptly, and before the following conditions are disturbed, provide written notice to City if Contractor finds any of the following conditions:

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

(2) Subsurface or latent physical conditions at the Worksite differing from those indicated by information about the Worksite made available to bidders prior to the deadline for submitting bids; or

(3) Unknown physical conditions at the Worksite of any unusual nature, materially different from those ordinarily encountered and generally recognized as inherent in work of the character required by the Contract Documents.

(B) ***City Investigation.*** City will promptly investigate the conditions and if City finds that the conditions do materially differ or do involve hazardous waste, and cause a decrease or increase in Contractor's cost

of, or the time required for, performance of any part of the Work, City will issue a Change Order.

(C) **Disputes.** In the event that a dispute arises between City and Contractor regarding any of the conditions specified in subsection (A) above, Contractor will not be excused from any scheduled completion date provided for in the Contract Documents, but must proceed with all Work to be performed under the Contract. Contractor will retain any and all rights provided either by the Contract or by law which pertain to the resolution of disputes between Contractor and City.

7.15 Trenching of Five Feet or More. As required by Labor Code Section 6705, if the Contract Price exceeds Twenty Five Thousand Dollars (\$25,000.00) and the Work includes the excavation of any trench or trenches of five (5) feet or more in depth, a detailed plan must be submitted to City or its civil or structural engineer, for acceptance in advance of the excavation. The detailed plan must show the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation. If the plan varies from the shoring system standards, it must be prepared by a registered civil or structural engineer. Use of a shoring, sloping, or protective system less effective than that required by the Construction Safety Orders is prohibited.

7.16 New Utility Connections. City will pay connection charges and meter costs for new permanent utilities required by the Contract Documents, if any. Contractor must notify City sufficiently in advance of the time needed to request service from each utility provider so that connections and services are initiated in accordance with the Project schedule.

7.17 Lines and Grades. Contractor is required to use any benchmark provided by the Engineer. Unless otherwise specified in the Contract Documents, Contractor must provide all lines and grades required to execute the Work.

7.18 Historic or Archeological Items.

(A) **Contractor's Obligations.** Contractor must ensure that all persons performing Work at the Project site are required to immediately notify Project Manager, upon discovery of any potential historic or archeological items, including historic or prehistoric ruins, burial grounds, archaeological or vertebrate paleontological site, including fossilized footprints or other archeological, paleontological or historical feature on the Project site (collectively, "Historic or Archeological Items").

(B) **Discovery; Cessation of Work.** Upon discovery of any potential Historic or Archeological Items, Work must be stopped within an eighty five (85) foot radius of the find and may not resume until authorized in writing by City. If required by City, Contractor must assist in protecting or recovering the Historic or Archeological Items, any such assistance to be compensated as extra work on a time and materials basis under Article 6, Contract Modification. Any suspension of Work required due to discovery of Historic or Archeological Items will be treated as a suspension for convenience under Article 13.

7.19 Environmental Control. Contractor must not pollute any drainage course or its tributary inlets with fuels, oils, bitumens, acids, insecticides, herbicides or other harmful materials. Contractor and its Subcontractors must at all times in the performance of the Work comply with all applicable federal, state, and local laws and regulations concerning pollution of waterways.

(A) **Stormwater Permit.** Contractor must comply with all applicable conditions of the State Water Resources Control Board national Pollutant Discharge Elimination System General Permit for Waste Discharge Requirements for Discharges of Stormwater Runoff Associated with Construction Activity (“Stormwater Permit”).

(B) **Contractor’s Obligations.** If required for the Work, a copy of the Stormwater Permit is on file in City’s principal administrative offices, and Contractor must comply with the same without adjustment of the Contract Price or the Contract Time. Contractor must timely and completely submit required reports and monitoring information required by the conditions of the Stormwater Permit, Contractor must comply with all other applicable state, municipal or regional laws, ordinances, rules or regulations governing discharge of stormwater, including applicable municipal stormwater management programs.

Article 8 Payment

8.1 Schedule of Values. Prior to submitting its first application for payment, Contractor must prepare and submit to Project Manager a schedule of values apportioned to the various divisions and phases of the Work. Each line item contained in the schedule of values must be assigned a value such that the total of all items equals the Contract Price. The items must be sufficiently detailed to enable accurate evaluation of the percentage of completion claimed in each application for payment, and the assigned value consistent with any itemized or unit pricing submitted with Contractor’s bid.

8.2 Progress Payments. Following the last day of each month, or as otherwise required by the Special Conditions or Specifications, Contractor will submit to Project Manager a monthly application for payment for Work performed during the preceding month based on the estimated value of the Work performed during that preceding month.

(A) **Application for Payment.** Each application for payment must be itemized to include labor, materials, and equipment incorporated into the Work, and materials and equipment delivered to the Worksite, as well as authorized and approved Change Orders. Each pay application must be supported by Contractor's schedule of values and any other substantiating data required by the Contract Documents.

Each application for payment shall be accompanied by completed "Contract Balance Form," a copy of which is provided at the end of Article 8.

(B) **Payment of Undisputed Amounts.** City will pay the undisputed amount due, as certified the Design Professional, within thirty (30) days after Contractor has submitted a complete and accurate payment application, subject to Public Contract Code Section 20104.50. City will deduct a percentage from each progress payment as retention, as set forth in Section 8.5, below, and may deduct additional amounts as set forth in Section 8.3, below.

8.3 Adjustment of Payment Application. City may adjust or reject a payment application, including application for Final Payment, in whole or in part, based upon any of the circumstances listed below. Contractor will be notified in writing of the basis for the adjustment, and will be promptly paid once the basis for that adjustment has been remedied and no longer exists.

(A) Contractor's unexcused failure to perform the Work as required by the Contract Documents, including correction or completion of punch list items;

(B) Loss or damage caused by Contractor or its Subcontractor(s) arising out of or relating to performance of the Work;

(C) Contractor's failure to pay its Subcontractors and suppliers when payment is due;

(D) Failure to timely correct rejected, nonconforming, or defective Work;

(E) Unexcused delay in performance of the Work;

- (F) Any unreleased stop notice, retained as one hundred twenty five percent (125%) of the amount claimed;
- (G) Failure to submit any required schedule or schedule update in the manner and within the time specified in the Contract Documents;
- (H) Failure to maintain or submit as-built documents in the manner and within the time specified in the Contract Documents;
- (I) Work performed without approved Shop Drawings, when approved Shop Drawings are required before proceeding with the Work;
- (J) Contractor's payroll records are delinquent or inadequate; and
- (K) Any other costs or charges that may be offset against payments due, as provided in the Contract Documents, including liquidated damages.

8.4 Acceptance of Work. Neither City's payment of progress payments nor its partial or full use or occupancy of the Project constitutes acceptance of any part of the Work.

8.5 Retention. City will retain five percent (5%) of the amount due on each progress payment, or the percentage stated in the Notice Inviting Bids, whichever is greater, as retention to ensure full and satisfactory performance of the Work.

(A) ***Substitution of Securities.*** As provided by Public Contract Code Section 22300, Contractor may request in writing that it be allowed, at its sole expense, to substitute securities for the retention withheld by City. Any escrow agreement entered into pursuant to this provision must fully comply with Public Contract Code Section 22300, and will be subject to approval as to form by City's legal counsel.

(B) ***Release of Undisputed Retention.*** All undisputed retention, less any amounts that may be assessed as liquidated damages, retained for stop notices, or otherwise withheld under Section 8.3 or 8.6 will be released as Final Payment to Contractor no sooner than thirty five (35) days following recordation of the notice of completion, and no later than sixty (60) days following acceptance of the Project by City's governing body or authorized designee, or, if the Project has not been accepted, no later than sixty (60) days after the Project is otherwise considered complete under Public Contract Code Section 7107(c).

8.6 Setoff. City is entitled to set off any amounts due from Contractor against any payments due to Contractor. City's entitlement to setoff includes progress payments as well as Final Payment and release of retention.

8.7 Payment to Subcontractors and Suppliers. Each month, Contractor must promptly pay each Subcontractor and supplier the value of the portion of labor, materials, and equipment incorporated into the Work or delivered to the Worksite by the Subcontractor or supplier during the preceding month. Such payments must be made in accordance with the requirements of the law, and those of the Contract Documents and applicable subcontract or supplier contract.

(A) **Withholding for Stop Notice.** City will withhold one hundred twenty five percent (125%) of the amount claimed by an unreleased stop notice, a portion of which may be retained by City for the costs incurred in handling the stop notice claim, including attorneys' fees and costs, as authorized by law.

(B) **Joint Checks.** City reserves the right to issue joint checks made payable to Contractor and its Subcontractors or suppliers. As a condition to release of payment by a joint check, the joint check payees may be required to execute a joint check agreement in a form provided or approved by City. The joint check payees will be jointly and severally responsible for the allocation and disbursement of funds paid by joint check. Payment by joint check will not be construed to create a contractual relationship between City and a Subcontractor or supplier of any tier beyond the scope of the joint check agreement.

8.8 Final Payment. Final Completion, acceptance of the Work by City, and recordation of the Notice of Completion, and any release required by the Contract Documents are conditions precedent to Final Payment and release of undisputed retention, as set forth above. Contractor's application for Final Payment must comply with the requirements for submitting an application for a progress payment as stated in Section 8.2, above. Corrections to previous progress payments, including adjustments to estimated quantities for unit priced items, may be included in the Final Payment. The date of Final Payment is deemed to be effective on the date that City acts to release retention as final payment to Contractor, or otherwise provides written notice to Contractor of Final Payment. If the amount due from Contractor to City exceeds the amount of Final Payment, City retains the right to recover the balance from Contractor or its sureties.

8.9 Release of Claims. City may, at any time, require that payment of the undisputed portion of any progress payment or Final Payment be contingent upon Contractor furnishing City with a written release of all claims against City arising from or related to the portion of Work covered

by those undisputed amounts. Any disputed amounts may be specifically excluded from the release.

8.10 Warranty of Title. Contractor warrants that title to all work, materials, or equipment incorporated into the Work and included in a request for payment will pass over to City free of any claims, liens, or encumbrances upon payment to Contractor.

CONTRACT BALANCE FORM

Project Name: Sanitary Sewer Lift Stations J & W Rehabilitation

Note: A detailed invoice MUST be attached to this Contract Balance Form.

CONTRACTOR NAME: _____	DATE: _____
MAILING ADDRESS: _____	TELEPHONE NO.: _____
_____	FAX NO.: _____
_____	PROJECT NO.: _____
	INVOICE NO.: _____

- | | |
|---|----------------|
| 1. ORIGINAL CONTRACT AMOUNT: | \$ _____ |
| 2. APPROVED CHANGE ORDERS TOTAL: | \$ _____ |
| 3. REVISED CONTRACT AMOUNT: | (1+2) \$ _____ |
| 4. PREVIOUS BALANCE PAID: | \$ _____ |
| 5. REMAINING BALANCE: | (3-4) \$ _____ |
| 6. CURRENT PROGRESS PAYMENT DUE:
<i>(before retention)</i> | \$ _____ |
| 7. 5% RETENTION FROM WORK DONE: | (-)\$ _____ |
| 8. CURRENT BALANCE DUE: | (6-7) \$ _____ |
| 9. REMAINING BALANCE OF REVISED
CONTRACT AMOUNT:
<i>(including retention)</i> | (5-8) \$ _____ |

Article 9 Labor Provisions

9.1 Discrimination Prohibited. Discrimination against any prospective or present employee engaged in the Work on grounds of race, color, ancestry, national origin, ethnicity, religion, sex, sexual orientation, age, disability, or marital status is strictly prohibited. Contractor and its Subcontractors are required to comply with all applicable Federal and California laws including the California Fair Employment and Housing Act (Government Code Sections 12900 et seq.), Government Code Section 11135, and Labor Code Sections 1735, 1777.5, 1777.6, and 3077.5.

9.2 Labor Code Requirements.

(A) ***Eight Hour Day.*** Under Labor Code Section 1810, eight (8) hours of labor constitute a legal day's work under this Contract.

(B) ***Penalty.*** Under Labor Code Section 1813, Contractor will forfeit to City as a penalty, the sum of \$25.00 for each day during which a worker employed by Contractor or any Subcontractor is required or permitted to work more than eight (8) hours in any one (1) calendar day or more than forty (40) hours per calendar week, except if such workers are paid overtime under Labor Code Section 1815.

(C) ***Apprentices.*** Contractor is responsible for compliance with the requirements governing employment and payment of apprentices, as set forth in Labor Code Section 1777.5, which is fully incorporated by reference.

(D) ***Notices.*** Under Labor Code Section 1771.4, Contractor is required to post all job site notices prescribed by law or regulation.

9.3 Prevailing Wages. Each worker performing Work under this Contract that is covered under Labor Code Section 1720, including cleanup at the Project site, must be paid at a rate not less than the prevailing wage as defined in Sections 1771 and 1774 of the Labor Code. The prevailing wage rates are available online at <http://www.dir.ca.gov/dlsr>. Contractor must post a copy of the applicable prevailing rates at the Worksite.

(A) ***Penalties.*** Under Labor Code Section 1775, Contractor and any Subcontractor will forfeit to City as a penalty up to Two Hundred Dollars (\$200.00) for each calendar day, or portion a day, for each worker paid less than the applicable prevailing wage rate. Contractor must also pay each worker the difference between the applicable prevailing wage rate and the amount actually paid to that worker.

(B) **Federal Requirements.** If this Project is subject to Federal prevailing wage requirements in addition to California prevailing wage requirements, Contractor and its Subcontractors are required to pay the higher of the current applicable prevailing wage rates under federal law, available online at <http://www.access.gpo.gov/davisbacon/ca.html>.

9.4 Payroll Records. Contractor must comply with the provisions of Labor Code Sections 1776 and 1812 and all implementing regulations, which are fully incorporated by this reference, including requirements for electronic submission of payroll records.

(A) **Contractor and Subcontractor Obligations.** Contractor and each Subcontractor must keep accurate payroll records, showing the name, address, social security number, work classification, straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker, or other employee employed in connection with the Work. Each payroll record must contain or be verified by a written declaration that it is made under penalty of perjury, stating both of the following:

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

(2) Contractor or Subcontractor has complied with the requirements of Labor Code Sections 1771, 1811, and 1815 for any Work performed by its employees on the Project.

(B) **Certified Record.** A certified copy of an employee's payroll record must be made available for inspection or furnished to the employee or his or her authorized representative on request, to City, or to the Division of Labor Standards Enforcement, and the Division of Apprenticeship Standards of the Department of Industrial Relations, and as further provided by the Labor Code.

(C) **Enforcement.** Upon notice of noncompliance with Labor Code Section 1776, Contractor or Subcontractor has ten (10) days in which to comply with requirements of this section. If Contractor or Subcontractor fails to do so within the ten (10) day period, Contractor or Subcontractor will forfeit a penalty of One Hundred Dollars (\$100.00) per day, or portion a day, for each worker for whom compliance is required, until strict compliance is achieved. Upon request by the Division of Apprenticeship Standards, or the Division of Labor Standards Enforcement, these penalties will be withheld from progress payments then due.

9.5 Labor Compliance. Under Labor Code section 1771.4, the Contract for this Project is subject to compliance monitoring and enforcement by the California Department of Industrial Relations.

9.6 Wage Theft Prevention. Compliance with Wage and Hour Laws: Contractor, and any subcontractor it employs to complete work under this Agreement, shall comply with all applicable federal, state and local wage and hour laws. Applicable laws may include, but are not limited to, the Federal Fair Labor Standards Act and the California Labor Code.

Final Judgments, Decisions, and Orders: For purposes of this Section, a “final judgment, decision, or order” refers to one for which all appeals have been exhausted or the time to appeal has expired. Relevant investigatory government agencies include: the federal Department of Labor, the California Division of Labor Standards Enforcement, or any other governmental entity or division tasked with the investigation and enforcement of wage and hour laws.

Prior Judgments against Contractor and/or its Subcontractors: BY SIGNING THIS AGREEMENT, CONTRACTOR AFFIRMS THAT IT HAS DISCLOSED ANY FINAL JUDGMENTS, DECISIONS OR ORDERS FROM A COURT OR INVESTIGATORY GOVERNMENT AGENCY FINDING – IN THE FIVE (5) YEARS PRIOR TO EXECUTING THIS AGREEMENT – THAT CONTRACTOR OR ITS SUBCONTRACTOR(S) HAS VIOLATED ANY APPLICABLE WAGE AND HOUR LAWS. CONTRACTOR FURTHER AFFIRMS THAT IT OR ITS SUBCONTRACTOR(S) HAS SATISFIED AND COMPLIED WITH – OR HAS REACHED AGREEMENT WITH THE CITY REGARDING THE MANNER IN WHICH IT WILL SATISFY – ANY SUCH JUDGMENTS, DECISIONS OR ORDERS.

Judgments or Decisions During Term of Contract: If at any time during the term of this Agreement, a court or investigatory government agency issues a final judgment, decision or order finding that Contractor or an subcontractor it employs to perform work under this Agreement has violated any applicable wage and hour law, or Contractor learns of such a judgment, decision, or order that was not previously disclosed, Contractor shall inform the City Attorney, no more than fifteen (15) days after the judgment, decision or order becomes final or of learning of the final judgment, decision or order. Contractor and its subcontractors shall promptly satisfy and comply with any such judgment, decision, or order, and shall provide the City Attorney with documentary evidence of compliance with the final judgment, decision or order within five (5) days of satisfying the final judgment, decision or order. The City reserves the right to require Contractor to enter into an agreement with the City regarding the manner in which any such final judgment, decision, or order will be satisfied.

City’s Right to Withhold Payment: Where Contractor or any subcontractor it employs to perform work under this Agreement has been found in violation of any

applicable wage and hour law by a final judgment, decision or order of a court or government agency, the City reserves the right to withhold payment to Contractor until such judgment, decision or order has been satisfied in full.

Material Breach: Failure to comply with any part of this Section constitutes a material breach of this Agreement. Such breach may serve as a basis for immediate termination of this Agreement and/or any other remedies available under this Agreement and/or law.

Notice to City Related to Wage Theft Prevention: Notice provided to the City Attorney as required under this Section shall be addressed to: City Attorney, City of Morgan Hill, 17575 Peak Avenue, Morgan Hill, CA 95037. The Notice provisions of this Section are separate from any other notice provisions in this Agreement and, accordingly, only notice provided to the above address satisfies the notice requirements in this Section.

Article 10 Safety Provisions

10.1 Safety Precautions and Programs. Contractor and its Subcontractors are fully responsible for safety precautions and programs, and for the safety of persons and property in the performance of the Work. Contractor and its Subcontractors must comply with all applicable safety laws, rules and regulations and seek to avoid injury, loss, or damage to persons or property by taking reasonable steps to protect its employees and other persons at the Worksite, materials and equipment stored on or off site, and property at or adjacent to the Worksite.

(A) **Reporting Requirements.** Contractor must immediately provide a written report to City of all recordable accidents and injuries occurring at the Worksite. If Contractor is required to file an accident report with a government agency, Contractor will provide a copy of the report to City.

(B) **Legal Compliance.** Contractor's safety program must comply with the applicable legal and regulatory requirements. Contractor must provide City with copies of all notices required by law or regulation.

(C) **Contractor's Obligations.** Any damage or loss caused by Contractor arising from the Work which is not insured under property insurance must be promptly remedied by Contractor.

(D) **Remedies.** If City determines, in its sole discretion, that any part of the Work or Worksite is unsafe, City may, without assuming responsibility for Contractor's safety program, require Contractor or its Subcontractor to cease performance of the Work or to take corrective measures to City's

satisfaction. If Contractor fails to promptly take the required corrective measures, City may perform them and deduct the cost from the Contract Price. Contractor agrees it is not entitled to submit a Claim for damages, for an increase in Contract Price, or for a change in Contract Time based on Contractor's compliance with City's request for corrective measures pursuant to this provision.

10.2 Hazardous Materials. Unless otherwise specified, this Contract does not include the removal, handling, or disturbance of any asbestos or other Hazardous Materials. If Contractor encounters materials on the Worksite that Contractor reasonably believes to be asbestos or other Hazardous Materials, and the asbestos or other Hazardous Materials have not been rendered harmless, Contractor may continue Work in unaffected areas reasonably believed to be safe, but must immediately cease work on the area affected and report the condition to City. No asbestos, asbestos-containing products or other Hazardous Materials may be used in performance of the Work.

10.3 Material Safety. Contractor must maintain Material Safety Data Sheets ("MSDS") at the Worksite, as required by law, for materials or substances used or consumed in the performance of the Work. The MSDS will be accessible and available to Contractor's employees, Subcontractors, and City.

(A) **Contractor Obligations.** Contractor is solely responsible for the proper delivery, handling, use, storage, removal, and disposal of all materials brought to the Worksite and/or used in the performance of the Work.

(B) **Labeling.** Contractor must ensure proper labeling on any material brought onto the Worksite so that any persons working with or in the vicinity of the material may be informed as to the identity of the material, any potential hazards, and requirements for proper handling, protections, and disposal.

Article 11 Completion and Warranty Provisions

11.1 Final Completion.

(A) **Final Inspection.** When the Work required by this Contract is fully performed, Contractor must provide written notification to Project Manager requesting final inspection. Based on this inspection, the Design Professional will prepare a punch list of items that are incomplete, incorrectly installed, or not operating as required by the Contract Documents. The omission of any such item from this punch list will not

relieve Contractor from fulfilling all requirements of the Contract Documents.

(B) **Punch List.** City will promptly deliver the punch list to Contractor and will specify the time by which all of the punch list items must be completed or corrected. The punch list may include City's estimated cost to complete each punch list item if Contractor fails to do so within the specified time.

(C) **Requirements for Final Completion.** Final Completion will be achieved upon completion or correction of all punch list items, as verified by inspection, and upon satisfaction of all other Contract requirements, including any commissioning required under the Contract Documents, and submission of all final submittals, including a warranty bond as required under Section 4.4, instructions and manuals as required under Section 7.10, and as-built drawings as required under Section 7.11, all to City's satisfaction. Once Final Completion is achieved, and the Project has been formally accepted by City, City will file a notice of completion with the County Recorder.

(D) **Final Payment.** Final Payment and release of retention, less any sums withheld pursuant to the provisions of the Contract Documents, will not be made sooner than thirty five (35) days after recordation of the notice of completion. If Contractor fails to complete all of the punch list items within the specified time, City may elect to accept the Project and record the notice of completion, and withhold up to one hundred fifty percent (150%) of City's estimated cost to complete the remaining items from Final Payment.

11.2 Warranty.

(A) **General.** Contractor warrants that all materials and equipment will be new unless otherwise specified, of good quality, in conformance with the Contract Documents, and free from defective workmanship and materials. Contractor further warrants that the Work will be free from material defects not intrinsic in the design or materials required in the Contract Documents. At City's request, Contractor must furnish satisfactory evidence of the quality and type of materials and equipment furnished. Contractor's warranty does not extend to damage caused by normal wear and tear, or improper use or maintenance.

(B) **Warranty Period.** Contractor's warranty must guarantee its Work for a period of one (1) year from the date of recordation of the notice of completion (the "Warranty Period"), except when a longer guarantee is provided by a supplier or manufacturer or is required by the Specifications or Special Conditions. Contractor must obtain from its Subcontractors,

suppliers and manufacturers any special or extended warranties required by the Contract Documents.

(C) **Warranty Documents.** As a condition precedent to acceptance, Contractor must supply City with all warranty and guarantee documents relevant to equipment and materials incorporated into the Work and guaranteed by their suppliers or manufacturers.

(D) **Subcontractors.** The warranty obligations in the Contract Documents apply to Work performed by Contractor and its Subcontractors, and Contractor expressly agrees to act as co-guarantor of such Work.

(E) **Contractor's Obligations.** Upon written notice from City to Contractor of any defect in the Work discovered during the Warranty Period, Contractor or its responsible Subcontractor must promptly correct the defective Work at its own cost. Contractor's obligation to correct defects discovered during the Warranty Period will continue past the expiration of the Warranty Period as to any defects in Work for which Contractor was notified prior to expiration of the Warranty Period.

(F) **City's Remedies.** If Contractor and/or its responsible Subcontractor fails to correct defective Work within ten (10) days following notice by City, or sooner, if required by the circumstances, Contractor expressly agrees that City may correct the defects to conform with Contract Documents at Contractor's sole expense, and Contractor agrees to reimburse City for its costs within thirty (30) days following City's submission of a demand for payment pursuant to this provision. If City is required to initiate legal action to compel Contractor's compliance with this provision, and City is the prevailing party in such action, Contractor is solely responsible for all of City's attorney's fees and legal costs expended to enforce Contractor's warranty obligations herein in addition to any and all costs incurred by City to correct the defective Work.

11.3 Use Prior to Final Completion. City reserves the right to occupy or make use of the Project, or any portions of the Project, prior to Final Completion if City has determined that the Project or portion of it is in a condition suitable for the proposed occupation or use, and that it is in its best interest to occupy or make use of the Project, or any portions of it, prior to Final Completion. City will notify Contractor in writing of its intent to occupy or make use of the Project or any portions of the Project, pursuant to this provision.

(A) **Non-Waiver.** Occupation or use prior to Final Completion will not operate as acceptance of the Work or any portion of it, nor will it operate as a waiver of any of City's rights or Contractor's duties pursuant to these

Contract Documents, and will not affect nor bear on the determination of the time of substantial completion with respect to any statute of repose pertaining to the time for filing an action for construction defect.

(B) **City's Responsibility.** City will be responsible for the cost of maintenance and repairs due to normal wear and tear with respect to those portions of the Project that are being occupied or used before final completion. The Contract Price or the Contract Time may be adjusted pursuant to the applicable provisions of these Contract Documents if, and only to the extent that, any occupation or use under this Section actually adds to Contractor's cost or time to perform the Work.

11.4 Substantial Completion. For purposes of determining "substantial completion" with respect to any statute of repose pertaining to the time for filing an action for construction defect, "substantial completion" is deemed to mean the last date that Contractor or any Subcontractor performs Work on the Project prior to recordation of the Notice of Completion, except for warranty work performed under this Article.

Article 12 Dispute Resolution

12.1 Claims. This Article applies to and provides the exclusive procedures for any Claim arising from or related to the Contract or performance of the Work.

(A) **Definition.** "Claim" means a separate demand by Contractor, submitted in writing, for change in the Contract Time or Contract Price that has previously been submitted to City in accordance with the requirements of the Contract Documents, and which has been rejected by City, in whole or in part.

(B) **Limitations.** A Claim may only include the portion of a previously rejected demand that remains in dispute between Contractor and City. With the exception of any dispute regarding the amount of money actually paid to Contractor as Final Payment, Contractor is not entitled to submit a Claim demanding a change in the Contract Time or the Contract Price, which has not previously been submitted to City in full compliance with Article 5 and Article 6, and subsequently rejected in whole or in part by City.

(C) **Scope of Article.** This Article is intended to provide the exclusive procedures for submission and resolution of Claims of any amount, and applies in addition to the provisions of Public Contract Code Section 9204 and Sections 20104 et seq.

(D) **No Work Delay.** Notwithstanding the submission of a Claim or any other dispute between the parties related to the Project or the Contract Documents, Contractor must perform the Work and may not delay or cease Work pending resolution of the Claim or other dispute, but must continue to diligently prosecute the performance and timely completion of the Work, including the Work pertaining to the Claim or other dispute.

12.2 Claims Submission. The following requirements apply to any Claim subject to this Article:

(A) **Substantiation.** The Claim must be submitted to City in writing, clearly identified as a “Claim” submitted pursuant to this Article 12, and must include all of the documents necessary to substantiate the Claim including the Change Order request that was rejected in whole or in part, and copy of the City’s written rejection that is in dispute. The Claim must clearly identify and describe the dispute, including relevant references to applicable portions of the Contract Documents, and a chronology of relevant events. Any Claim for additional payment must include a complete, itemized breakdown of all labor, materials, taxes, insurance, and subcontract, or other costs. Substantiating documentation such as payroll records, receipts, invoices, or the like, must be submitted in support of each claimed cost. Any Claim for an extension of time or delay costs must be substantiated with schedule analysis and narrative depicting and explaining claimed time impacts.

(B) **Claim Format.** A Claim must be submitted in the following format:

- (1) General introduction, specifically identifying the submission as a “Claim” submitted under this Article 12.
- (2) Relevant background information, including identification of the specific demand at issue, and the date of City's rejection of that demand.
- (3) Detailed explanation of the issue(s) in dispute. For multiple issues, separately number and identify each issue and include the following for each separate issue:
 - (a) The background of the issue, including references to relevant provisions of the Contract Documents;
 - (b) A succinct statement of the matter in dispute, including Contractor’s position and the basis for that position;
 - (c) A chronology of relevant events;

(d) The identification and attachment of all supporting documents (see subsection (A), above, on Substantiation); and

(e) Use of a separate page for each issue.

(4) Summary of issues and damages.

(5) The following certification, executed by Contractor's authorized representative:

"The undersigned Contractor certifies under penalty of perjury that its statements and representations in this Claim are true and correct. Contractor warrants that this Claim is comprehensive and complete as to the matters in dispute, and agrees that any costs, expenses, or delay claim not included herein are deemed waived. Contractor understands that submission of a Claim which has no basis in fact or which Contractor knows to be false may violate the False Claims Act (Government Code Section 12650 et seq.)."

(C) ***Submission Deadlines.***

(1) A Claim must be submitted within fifteen (15) days following the date that City notified Contractor in writing that a request for a change in the Contract Time or Contract Price, duly submitted in compliance with Article 5 and Article 6, has been rejected in whole or in part.

(2) With the exception of any dispute regarding the amount of Final Payment, any Claim must be filed on or before the date of Final Payment, or will be deemed waived.

(3) A Claim disputing the amount of Final Payment must be submitted within fifteen (15) days of the effective date of Final Payment, under Section 8.8, above.

(4) Strict compliance with these Claim submission deadlines is necessary to ensure that any dispute may be mitigated as soon as possible, and to facilitate cost-efficient administration of the Project. Any Claim that is not submitted within the specified deadlines will be deemed waived by Contractor.

12.3 City's Response. City will respond within forty five (45) days of receipt of the Claim with a written statement identifying which portion(s) of the Claim are disputed, unless the forty five (45)-day period is extended by mutual

agreement of City and Contractor. However, the City may first request, in writing, within thirty (30) days of receipt of the Claim, any additional documentation supporting the Claim or relating to defenses to the Claim that City may have against Contractor. If Contractor fails to submit the additional documentation to City within fifteen (15) days of receipt of City's request, the Claim will be deemed waived.

(A) **Additional Information.** If additional information is thereafter required, it may be requested and provided upon mutual agreement of City and Contractor.

(B) **City's Response.** City's written response to the Claim, as further documented, will be submitted to Contractor within fifteen (15) days after receipt of the further documentation or within a period of time no greater than that taken by Contractor in producing the additional information, whichever is greater.

(C) **Non-Waiver.** Any failure by City to respond within the times specified above may not be construed as acceptance of the Claim in whole or in part, or as a waiver of any provision of these Contract Documents.

12.4 Meet and Confer. If Contractor disputes City's written response, or City fails to respond within the specified time, Contractor must notify City in writing, either within fifteen (15) days of receipt of City's response, or within fifteen (15) days of City's failure to respond within the specified time, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. If Contractor fails to dispute City's response, in writing, within the specified times, Contractor's Claim will be deemed waived.

(A) **Schedule Meet and Confer.** Upon receipt of the demand to meet and confer, City will schedule the meet and confer conference to be held within thirty (30) days, or later if needed to ensure the mutual availability of all of the individuals that each party requires to represent its interests at the meet and confer conference.

(B) **Location for Meet and Confer.** The meet and confer conference will be scheduled at a location at or near City's principal office.

(C) **Written Statement After Meet and Confer.** Within ten (10) working days after the meet and confer has concluded, City will issue a written statement identifying which portion(s) of the Claim remain in dispute, if any.

(D) **Submission to Mediation.** If the Claim or any portion remains in dispute following the meet and confer conference, within ten (10) working

days after the City issues the written statement identifying any portion(s) of the Claim remaining in dispute, the disputed portion(s) will be submitted for mediation as set forth below.

12.5 Mediation and Government Code Claims.

(A) **Mediation.** Mediation under this Article will be scheduled within sixty (60) days following conclusion of the meet and confer process, with a mediator that the parties mutually agreed upon. The mediation itself may take place more than sixty (60) days following conclusion of the meet and confer process to ensure the mutual availability of the selected mediator and all of the individuals that each party requires to represent its interests. The parties must share the costs of mediation equally, except costs incurred by each party for representation by legal counsel or any other consultant.

(B) Government Code Claims.

(1) Timely presentment of a Government Code Claim is a condition precedent to filing any legal action based on or arising from the Contract.

(2) The time for filing a Government Code Claim will be tolled from the time Contractor submits its written Claim pursuant to Section 12.2, above, until the time that Claim is denied as a result of the meet and confer process, including any period of time used by the meet and confer process. If the parties agree to mediation, the time for filing a Government Code Claim will be tolled until conclusion of the mediation if the Claim is not fully resolved by mutual agreement of the parties during the mediation or any continuation of the mediation.

12.6 Tort Claims. This Article does not apply to tort claims and nothing in this Article is intended nor will be construed to change the time periods for filing tort-based Government Code Claims.

12.7 Arbitration. It is expressly agreed, under California Code of Civil Procedure Section 1296, that in any arbitration to resolve a dispute relating to this Contract, the arbitrator's award must be supported by law and substantial evidence.

12.8 Damages. Contractor bears the burden of proving entitlement to and the amount of any claimed damages. Contractor is not entitled to damages calculated on a total cost basis, but must prove actual damages. Contractor is not entitled to recovery of any alleged home office overhead. The Eichleay Formula or similar formula may not be used for any recovery

under the Contract. Contractor is not entitled to consequential damages, including home office overhead or any form of overhead not directly incurred at the Worksite; lost profits; loss of productivity; lost opportunity to work on other projects; diminished bonding capacity; increased cost of financing for the Project; extended capital costs; non-availability of labor, material or equipment due to delays; or any other indirect loss arising from the Contract.

- 12.9 Other Disputes.** The procedures in this Article 12 will apply to any and all disputes or legal actions, in addition to Claims, arising from or related to this Contract, unless and only to the extent that compliance with a procedural requirement is expressly and specifically waived by City. Nothing in this Article is intended to delay suspension or termination under Article 13.

Article 13 Suspension and Termination

- 13.1 Suspension for Cause.** In addition to all other remedies available to City, if Contractor fails to perform or correct work in accordance with the Contract Documents, City may immediately order the Work, or any portion of it, suspended until the cause for the suspension has been eliminated to City's satisfaction.

(A) ***Failure to Comply.*** Contractor will not be entitled to an increase in Contract Time or Contract Price for a suspension occasioned by Contractor's failure to comply with the Contract Documents.

(B) ***No Duty to Suspend.*** City's right to suspend the Work will not give rise to a duty to suspend the Work, and City's failure to suspend the Work will not constitute a defense to Contractor's failure to comply with the requirements of the Contract Documents.

- 13.2 Suspension for Convenience.** City reserves the right to suspend, delay, or interrupt the performance of the Work in whole or in part, for a period of time determined to be appropriate for City's convenience, and not due to any act or omission by Contractor or its Subcontractors. Upon notice by City pursuant to this provision, Contractor must immediately suspend, delay, or interrupt the Work as directed by City. The Contract Price and the Contract Time will be equitably adjusted by Change Order to reflect the cost and delay impact occasioned by such suspension for convenience.

- 13.3 Termination for Default.** Contractor may be deemed in default for a material breach of or inability to perform the Contract, including Contractor's refusal or failure to supply sufficient skilled workers, proper materials, or equipment to perform the Work within the Contract Time;

refusal or failure to make prompt payment to its employees, Subcontractors, or suppliers or to correct rejected work; disregard of laws, regulations, ordinances, rules, or orders of any public agency with jurisdiction over the Project; or if Contractor lacks financial capacity to complete the Work within the Contract Time; or is otherwise responsible for a material breach of the Contract requirements.

(A) **Notice.** Upon City's determination that Contractor is in default, City may provide Contractor and its surety written notice of default and intent to terminate the Contract.

(B) **Termination.** Within seven (7) calendar days after notice of intent to terminate for default has been given, unless the default is cured or arrangements to cure the default have been made and memorialized in writing, to City's satisfaction, City may terminate the Contract by written notice to Contractor with a copy to Contractor's surety.

(C) **Waiver.** Time being of the essence in the performance of the Work, if Contractor's surety fails to arrange for completion of the Work in accordance with the Performance Bond, within seven (7) calendar days from the date of the notice of termination, Contractor's surety will be deemed to have waived its right to complete the Work under the Contract, and City may immediately make arrangements for the completion of the Work through use of its own forces, by hiring a replacement contractor, or by any other means that City determines advisable under the circumstances. Contractor and its surety will be jointly and severally liable for any additional cost incurred by City to complete the Work following termination. In addition, City will have the right to use any materials, supplies, and equipment belonging to Contractor and located at the Worksite for the purposes of completing the remaining Work.

(D) **Wrongful Termination.** If a court of competent jurisdiction or an arbitrator later determines that the termination for default was wrongful, the termination will be deemed to be a termination for convenience, and Contractor's damages will be strictly limited to the compensation provided for termination for convenience, in Section 13.4, below. Contractor waives any claim for any other damages for wrongful termination including consequential damages, lost opportunity costs or lost profits.

13.4 Termination for Convenience. City reserves the right to terminate all or part of the Contract for convenience upon written notice to Contractor. Upon receipt of such notice, Contractor must immediately stop the Work, comply with City's instructions to protect the completed Work and materials, and use its best efforts to minimize further costs. In the event of termination for convenience, the parties agree that the following will

constitute full and fair compensation to Contractor, and that Contractor will not be entitled to any additional compensation:

- (A) **Completed Work.** The value of its Work satisfactorily performed to date, including Project overhead and profit based on Contractor's schedule of values;
- (B) **Demobilization.** Actual and substantiated demobilization costs; and
- (C) **Markup.** Five percent (5%) of the total value of the Work performed as of the date of notice of termination or five percent (5%) of the value of the Work yet to be completed, whichever is less.

13.5 Provisions Remaining in Effect. Upon termination pursuant to this Article, the provisions of the Contract Documents remain in effect as to any claim, indemnity obligation, warranties, guarantees, submittals of as-built drawings, instructions, or manuals, or other such rights and obligations arising prior to the termination date.

Article 14 Miscellaneous Provisions

14.1 Assignment of Unfair Business Practice Claims. Under Public Contract Code Section 7103.5, Contractor and its Subcontractors agree to assign to City all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Section 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, services, or materials pursuant to the Contract or subcontract. This assignment will be effective at the time City tenders Final Payment to Contractor, without further acknowledgement by the parties.

14.2 Provisions Deemed Inserted. Every provision of law required to be inserted in the Contract Documents is deemed to be inserted, and the Contract Documents will be construed and enforced as though such provision has been included. If it is discovered that through mistake or otherwise that any required provision was not inserted, or not correctly inserted, the Contract Documents will be amended accordingly.

14.3 Waiver. No waiver of a breach, failure of any condition, or any right or remedy contained in or granted by the provisions of the Contract Documents will be effective unless it is in writing and signed by the party waiving the breach, failure, right, or remedy. No waiver of any breach,

failure, right, or remedy will be deemed a waiver of any other breach, failure, right, or remedy, whether or not similar, nor will any waiver constitute a continuing waiver unless specified in writing by the waiving party.

14.4 Titles, Headings, and Groupings. The titles and headings used and the groupings of provisions in the Contract Documents are for convenience only and may not be used in the construction or interpretation of the Contract Documents or relied upon for any other purpose.

14.5 Statutory and Regulatory References. With respect to any amendments to any statutes or regulations referenced in these Contract Documents, the reference is deemed to be the version in effect on the date that that bids were due.

END OF GENERAL CONDITIONS

SPECIAL CONDITIONS

1.1 **Construction Water and Wastewater.** City will provide water required for performance of the Work. Contractor is responsible for the appropriate disposal of waste water in coordination with City personnel. Contractor must provide a backflow preventer on all point of connections to City's Water System. All backflow preventers must be checked and approved by City's Public Works Water Division. Contractor must provide a deposit (refundable) and make necessary arrangements to pick up a hydrant meter at City's Public Works Office. At the completion of the Project, if the hydrant meter is not returned promptly or if it is damaged, Contractor shall forfeit its deposit.

2.1 **Equipment.** Contractor must provide and use equipment and plants suitable to produce the quality of Work and materials required by the Contract Documents. Contractor may be required to remove equipment which the Engineer deems unsuitable for the Work. Contractor must ensure that equipment is operated by trained, experienced operators, and at a speed or rate of production not to exceed that recommended by the manufacturer. Any vehicles used to haul materials over existing streets and highways must be equipped with pneumatic tires.

3.1 **Lines and Grades.** The Engineer will set the stakes or marks necessary to establish the lines and grades required for the completion of the Work in accordance with the Contract Documents. Contractor must give at least two (2) working days' notice to the Engineer of the need for setting any lines and grades.

(A) **Measurements.** Distances and measurements are given and will be made in a horizontal plane. Grades are given from the top of stakes or nail unless otherwise noted. Three (3) consecutive points shown on the same rate of slope must be used in common in order to detect any variation from a straight grade. Any variation from a straight grade, straight slope or line, must be reported to the Engineer. If such discrepancy is not reported to the Engineer, Contractor is responsible for any error in the finished work.

(B) **Stakes.** Contractor must preserve all stakes and points set for lines, grades or measurements of the Work in their proper places until authorized by the Engineer to remove them. All expense incurred by replacing stakes that have been removed without proper authority may be deducted from any payment due to Contractor.

4.1 **Disposal of Materials Outside of Street Right-of-Way.** Unless otherwise specified in the Specifications or Special Conditions, Contractor is solely responsible for disposing of materials outside the street right-of-way and for all associated costs. Before disposing materials outside the street right-of-way, Contractor must 1) obtain a written release from the property owner

releasing City from any and all responsibility in connection with the disposal of material on that property; and 2) obtain permission from the Engineer to dispose of the material at the permitted location.

5.1 **Emergency Contact.** Prior to the commencement of Work on the Project, Contractor must provide contact information to the Engineer for the person designated by Contractor to respond to any emergency that arises on the Worksite during the course of the Project. That person will be responsible for responding to the Worksite within thirty (30) minutes following notification of an emergency by City's Police or Fire Department, regardless of the time of day.

6.1 **Right-of-Way.** City will provide the right-of-way for performance of the Work. Contractor is solely responsible for any additional area required outside of the designated the right-of-way, unless otherwise provided in the Contract Documents.

(A) **Environmental Control.** Contractor must not pollute any drainage course or its tributary inlets with fuels, oils, bitumens, acids, insecticides, herbicides or other harmful materials. Contractor and its subcontractors shall at all times in the performance of the Work comply with all applicable federal, state, and local laws and regulations concerning pollution of waterways.

7.1 **Authorized Work Days and Hours.**

(A) **Authorized Work Days.** Except as expressly authorized in writing by City, Contractor is limited to performing Work on the Project on the following days of the week, excluding holidays observed by City: Monday through Friday.

(B) **Authorized Work Hours.** Except as expressly authorized in writing by City, Contractor is limited to performing Work on the Project during the following hours: 8:00 a.m. to 5:00 p.m.

8.1 **Bay Area Air Quality Management District (BAAQMD) Permits.** The Contractor shall submit the stationary generator equipment submittal (for lift station J only) within fourteen (14) calendar days of the issuance date of the Notice-to-Proceed letter for City review and approval. The stationary generator equipment's information is required for the Contractor's BAAQMD permit applications to construct and operate. The Contractor shall expeditiously file the permit application and install the generator upon BAAQMD issuance of the site's permit to construct.

9.1 **Construction Yard Staging.** The Contractor shall be responsible for acquiring or leasing space for temporary construction material and equipment staging. Any staging on private property shall be arranged and agreed upon

solely between the Contractor and Property Owner(s). The Contractor shall provide the City a copy of the executed project related staging agreement between the Contractor and Property Owner(s).

10.1 Temporary Sewer Bypass Operations. The Contractor shall maintain sewer service at all times during project. If temporary sewer bypasses are necessary, the Contractor shall submit the site-specific sewer bypass plans for City review and approval prior to the implementation of the temporary sewer bypasses.

(A) **Plan.** The temporary sewer bypass plan shall include, but not limited to, the following:

(1) Site Drawings prepared in conjunction with the traffic control plans (if applicable) and shown on the same drawings as the traffic control plans. The drawings shall include the staging area for the pumps and power sources, location of suction and discharge piping, and location and type of sewer plugs.

(2) Calculations to support the pump and pipe size selection, including plots of the system and pump curves. Calculations shall be prepared and stamped by a registered California Civil or Mechanical Engineer.

(3) Operation Plan that describes how the system will be monitored and controlled.

(4) Emergency Response Plan to be followed in the event of a failure of the sewage bypassing system.

(B) **Materials.** The temporary bypass systems' pumps, piping, and appurtenances shall be suitable for use with sewage and necessary to maintain the existing system's flow for each sewer lift station. Plugs shall include tethers. All pumps and their power sources shall have sound attenuated housing, mufflers, and any equipment required to minimize the equipment operation noise.

The pumped sewage shall be in an enclosed hose or pipe that is adequately protected from traffic and shall be redirected into a sanitary sewer system. Dumping or free flow of sewage on private property, gutters, streets, sidewalks, or into storm sewers is prohibited.

Provide backup pumping capacity equal to at least the design flow. Backup pump(s) shall be installed on the bypass piping systems and connected to the power source, ready for use if the primary pump(s) fail.

(C) **Operations.** Bypassing shall be done in such a manner as not to damage private or public property or create a nuisance or public menace. The Contractor shall take all necessary precautions including constant monitoring of bypass system to assure that private residences or properties are not subjected to a sewage backup or spill. The Contractor shall be liable for all cleanup, damages, and resultant fines in the event of a spill.

If residential building sewers are disconnected from the main, advise the residents to reduce flow and monitor the building sewer. Pump out the building sewer as needed to assure the capacity is not exceeded, not less than once a day.

Leakage Testing: Prior to activating sewage pump, the bypassing systems shall be successfully pressure tested with potable water at a pressure equal to at least 125 percent of the maximum working pressure for a period of at least twenty minutes with no leakage. Testing with a gas will not be permitted. Tests shall be conducted in the presence of the City's inspector. Provide at least forty eight (48) hours notice to the inspector.

The Contractor shall notify the Engineer twenty-four (24) hours prior to commencing the sanitary sewer bypass pumping operation. (The log shall include the name of the bypassing supervisor, pump r.p.m., manhole levels, unusual pipe conditions, etc.).

The Contractor shall continuously monitor the bypass pumping system and manholes upstream of the bypass to verify that it is operating properly and not leaking.

The Contractor shall keep a log of pumping operations, and note any unusual conditions and corrective measures therein.

The Contractor shall maintain the bypass operations until the work is approved by the City.

After the permanent sewer work is completed, tested and approved by the City, restore the flow to the permanent sewer, dismantle and remove the bypass system, and repair any damage to streets and landscaping.

Shallow, plated trenches or flow through ramps shall be used for bypass piping at driveways, sidewalks, or intersections per approval by the City. Repair street and sidewalk, and restore pavement markings damaged constructing trenches in accordance with the City's Standard Specifications and Details.

(D) **Measurement and Payment.** Measurement and payment for the temporary sewer bypass operations shall be in accordance with Section 01025 of the Specifications.

11.1 **Supplemental Work.** The work shall include any new or unforeseen work not specified for on the plans and specifications. The assigned lump sum dollar amount listed in Bid Schedule III will be included in each bidder's proposal. Supplemental work shall be performed only upon direct written authorization from the Engineer. Agreed price may be used as an alternate method of payment, if directed by the Engineer.

END OF SPECIAL CONDITIONS

**CITY OF MORGAN HILL
SANTA CLARA COUNTY, CALIFORNIA**



CONTRACT DOCUMENTS
FOR THE
CONSTRUCTION OF

**LIFT STATIONS J & W
REHABILITATION**

PROJECT NO.

FEBRUARY, 2018

**SPECIFICATIONS
(Divisions 1 through 16)**

DIVISION 1 - GENERAL REQUIREMENTS

SECTION NO.	TITLE
01025	MEASUREMENT AND PAYMENT
01330	SUBMITTAL PROCEDURES
01600	PRODUCT REQUIREMENTS
01782	OPERATION AND MAINTENANCE DATA

DIVISION 2 - SITE CONSTRUCTION

SECTION NO.	TITLE
02260	EXCAVATION SUPPORT AND PROTECTION
02300	EARTHWORK
02318	TRENCHING
02622	FILTER FABRIC AND GEOTEXTILES
02722	AGGREGATE BASE COURSE
02742	ASPHALTIC CONCRETE PAVING
02830	MODULAR RETAINING WALL SYSTEM
02990	PAVEMENT RESTORATION AND REHABILITATION

DIVISION 3 - CONCRETE

SECTION NO.	TITLE
03200	CONCRETE REINFORCEMENT
03300	CAST-IN-PLACE CONCRETE
03400	PRECAST CONCRETE

DIVISION 5 - METALS

SECTION NO.	TITLE
05430	SLOTTED CHANNEL FRAMING

DIVISION 8 - DOORS AND WINDOWS

SECTION NO.	TITLE
08310	ACCESS DOORS

DIVISION 9 - FINISHES

SECTION NO.	TITLE
09800	COATING SYSTEMS
09900	WET WELL COATING SYSTEM

DIVISION 11 - EQUIPMENT

SECTION NO.	TITLE
11320	SUBMERSIBLE PUMPS

DIVISION 13 – SPECIAL CONSTRUCTION

SECTION NO.	TITLE
13120	PRE-ENGINEERED CANOPY

DIVISION 15 - MECHANICAL

SECTION NO.	TITLE
15050	BASIC MECHANICAL MATERIALS AND METHODS
15052	BASIC PIPING MATERIALS AND METHODS
15110	VALVES
15250	PIPE AND FITTINGS

DIVISION 16 - ELECTRICAL

SECTION NO.	TITLE
16010	ELECTRICAL GENERAL REQUIREMENTS
16050	BASIC ELECTRICAL MATERIALS AND METHODS
16110	RACEWAYS

16120	WIRE AND CABLE
16130	BOXES
16170	GROUNDING AND BONDING
16195	ELECTRICAL IDENTIFICATION
16427	POWER PEDESTALS
16600	EMERGENCY POWER SYSTEMS
16630	ENGINE-GENERATOR SET
16635	AUTOMATIC TRANSFER SWITCHES

END OF SECTION

**SECTION 01025
MEASUREMENT AND PAYMENT**

PART 1 GENERAL

1.01 MEASUREMENT OF QUANTITIES

- A. Measurements of the completed work shall be in accordance with, and by instruments and devices calibrated to United States Standard Measures and the units of measurement for payment, and the limits thereof, shall be made as shown on the Plans, Specifications, General Requirements, and Supplementary Conditions.
- B. Payment for the various items of the Bid Schedule, as further described herein, shall include all compensation to be received by the Contractor for furnishing all tools, equipment, supplies and manufactured items and for all operations, and incidental appurtenances to the items of work being described, as necessary to complete the various items of work all in accordance with the requirements of the Contract Documents. Payment for the various items of the Bid Schedule shall include all costs of permits, business licenses, and the cost of compliance with the regulations of public agencies having jurisdiction, including the Department of Public Health, Safety and Health Requirements of the California Division of Industrial Safety and the Occupational Safety and Health Administration of the U.S. Department of Labor (OSHA). No separate payment will be made for any item that is not specifically set forth in the Bid Schedule, and all costs therefore shall be included in the prices named in the Bid Schedule for various appurtenant items of work.

1.02 UNITS OF MEASUREMENT

- A. Measurements shall be in accordance with U.S. Standard Measures. A pound is an avoirdupois pound. A ton is 2,000 pounds avoirdupois. The unit of liquid measure is the U.S. gallon.
- B. When payment is to be made on the basis of weight, the weighing shall be done on certified platform scales, or when approved by the City's Representative, on a completely automated weighing and recording system. The Contractor shall furnish the City's Representative with duplicate licensed weighmaster's certificates showing the actual net weights. The City will accept the certificates as evidence of the weights delivered.

1.03 METHODS OF MEASUREMENT

- A. Materials and items of work, which are to be paid for on the basis of measurement, shall be measured in accordance with the method stipulated in the particular sections involved. In determining quantities, all measurements shall be made in a horizontal plane unless otherwise specified.

- B. Material not used in the work and remaining on a transporting vehicle shall be determined by the City's Representative and deducted from the certified tag.
- C. When material is to be measured and paid for on a volume basis and it would be impractical to determine the volume, or when requested by the Contractor in writing and approved by the City in writing, the material will be weighed and converted to volume measurement for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the City and shall be agreed to by the Contractor before such method of measurement of pay quantities will be adopted.
- D. Full compensation for all expense involved in conforming to the above requirements for measuring and weighing materials shall be considered as included in the unit prices paid for the materials being measured or weighed and no additional allowances will be made therefore.
- E. Quantities of material wasted or disposed of in a manner not called for under the Contract; or rejected loads of material, including material rejected after it has been placed by reason of failure of the Contractor to conform to the provisions of the Contract; or material not unloaded from the transporting vehicle; or material placed outside the lines indicated on the plans or given by the City's Representative; or material remaining on hand after completion of the Contract, will not be paid for and such quantities will be deducted from the final total quantities. No compensation will be allowed for hauling rejected material.

1.04 DESCRIPTION OF BID ITEMS

- A. The bid items are presented to indicate major categories of the work for purposes of comparative bid analyses, and a preliminary breakdown for monthly progress payments. Bid items are not intended to be exclusive descriptions of work categories and the Contractor shall determine and include in its pricing all materials, labor, and equipment necessary to complete each Bid Item as shown and specified.
- B. Contractor shall perform all work depicted in the Contract Documents whether it is specifically mentioned in the Bid Schedule and bid item descriptions or not. The Bid Schedule and the Bid Item Descriptions below are intended to cover any and all Work depicted in the Contract Documents. Not all elements of every part of the Work are explicitly listed. It is the intention of City and a provision of this Contract, that any and all of the Work depicted shall be included in Contractor's bid and installed complete at a price included in a Bid Item submitted with Contractor's bid. No adjustments will be made to unit, extended, or total prices for an item that is depicted in the contract documents but is not specifically described or itemized. Such items may be included for payment in a bid item of the Contractors' choice, as long as the chosen bid item is closely related.

C. Bid Item Descriptions

1. Lift Station J Mobilization/Demobilization

The lump sum bid price for this item shall constitute full compensation for preparatory work and operations, including but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the project sites; for the establishment of all field offices, fencing and other facilities necessary for work on the Project at Lift Station J; and for all other work and operations which must be performed or costs incurred prior to beginning work on the various contract items on the project site. This bid item also includes demobilization at the completion of work.

2. Lift Station J Excavation Protection

This Bid item includes all work necessary to comply with OSHA, Cal OSHA, and California Labor Code Section 6707 including the preparation of an excavation safety plan at Lift Station J. Measurement for this item will be equal to the percentage of grading and excavation completed as specified herein and as estimated by the City. This Bid item shall include full compensation for completion of all planning, design, engineering fees, furnishing and construction, and removal and disposal of such temporary sheeting, shoring and bracing, complete, as required under the provisions of any permits, and in accordance with the requirements of OSHA and the Construction Safety Orders of the State of California, pursuant to the provisions of Sections 6700 through 6708 of the California Labor Code. Payment for this item shall be on a lump sum basis.

3. Lift Station J Bypass Pumping and Piping

The lump sum bid price for this item shall constitute full compensation for providing all materials, labor, tools, equipment, services and power to provide adequate pumping of sanitary sewage at Lift Station J throughout construction. Sewage service must be maintained at all times and the Contractor shall be responsible for providing adequate pumping capacity.

4. Lift Station J Demolition

The lump sum bid for this item includes all required labor, materials and equipment to demolish, remove, transport, and dispose of all items designated for removal on the contract plans at the Lift Station J Site. These items include, but are not limited to; existing electrical panels, site lighting equipment, pumps and accessories, sewer pipe and fittings, concrete slabs, valve vault, concrete boxes, and wood retaining wall around the existing PG&E vault as indicated in the contract documents. This bid item shall include all excavation, backfill, and surface restoration as required. Items to be salvaged shall be cleaned and transported to the designated location at no additional cost to the City.

5. Lift Station J Pumps & Base Elbows

This bid item includes all costs, materials and labor required to furnish and install sewage pumps and pump base elbows at Lift Station J in accordance with this contract. This bid item shall also include all costs,

materials and labor required to salvage an existing sewage pump within the existing Lift Station J as indicate in the contract documents. It will be paid on a per pump basis.

6. Lift Station J Miscellaneous Pump Equipment

The lump sum price bid for this item shall constitute full compensation to provide labor, materials and equipment necessary to provide a fully functioning pumping installation, including, pump guide rails, pump guiderail brackets, and pump lifting chains. The lump sum price for this bid item includes the miscellaneous pump equipment for both pumps in Lift Station J.

7. Lift Station J Piping, Fittings, and Valves

The lump sum price for this item shall include all materials, labor and equipment required to furnish and install all pump discharge piping, valves and fittings, at Lift Station J as called out on the contract plans. Included in this bid item is the installation of all piping, fittings, valves, supports and accessories from the pump discharge within the wet well to the coupling just outside of the valve vault for connection to the force main. Also included is the force main back drain into the wet well and the bypass pumping connection.

8. Station J New Force Main

The unit price bid per linear foot for this item shall include all materials, labor and equipment needed to furnish and install the PVC sanitary sewer force main pipe at Station J from the coupling just outside of the valve vault to the connection to the existing force main as indicated in the contract documents. This bid item shall include potholing and utility investigation to field-locate the existing force main for the connection of the new force main. This bid item shall also include all required pipe, fittings, accessories, backfill, excavation, bedding material and other materials required to furnish a complete and functioning sanitary sewer force main pipe.

The installation of asphaltic concrete pavement over the trench shall not be included in this bid item. (The installation of asphaltic concrete pavement shall be included in Bid Item 18 – Lift Station J Asphaltic Concrete Paving.)

9. Lift Station J Wet Well Improvements

The lump sum price bid for this item shall include all labor, equipment and materials required to provide and install all required wet well improvements to Lift Station J. Included is the installation of a new traffic-rated precast concrete top slab with a traffic-rated access hatch. Also included are improvements to the invert of the wet well structure, including the formation of a trough sump as shown on the contract plans.

The coating of the wet well shall not be included in this bid item. (The coating of the wet well shall be included in Bid Item 10 – Lift Station J Wet Well Coating.)

10. Lift Station J Wet Well Coating

The unit price bid per wet well for this item shall include all labor, equipment and materials required to provide and install a coating system on the interior of the Lift Station J wet well in accordance with these Specifications. This Bid item includes all necessary surface preparation measures and all other work required to achieve a complete coating system.

11. Lift Station J Precast Concrete Valve Vault

The lump sum bid price for this item shall include all labor, equipment and materials required to furnish and install a traffic-rated precast concrete valve vault at Lift Station J, including the specified traffic-rated access hatch, drain rock, and geotextile.

12. Lift Station J Electrical Panel Concrete Slab

This bid item includes concrete and reinforcement required to construct the poured-in-place concrete slab supporting the Lift Station J electrical panel as shown on the contract plans. This Bid item includes full compensation for constructing the concrete slab complete and in-place, including base rock, form work, steel reinforcement, concrete placement and compaction, curing, and form stripping. Repairs made to correct defects in concrete work shall be included with this Bid item at no additional charge to the City. Payment for this item shall be on a lump sum basis.

13. Lift Station J Canopy

This bid item includes all required design, material, equipment and labor necessary to furnish and install the canopy to shelter the Lift Station J electrical panel as shown on the contract plans and described in the specifications. This Bid item includes full compensation for constructing the canopy, including framing, roofing, and anchorage, complete and in-place, including design, fabrication, coating, and installation. Payment for this item shall be on a lump sum basis.

14. Lift Station J Generator Concrete Slab

This bid item includes concrete and reinforcement required to construct the poured-in-place concrete slab supporting the Lift Station J generator as shown on the contract plans. This Bid item includes full compensation for constructing the concrete slab complete and in-place, including base rock, form work, steel reinforcement, concrete placement and compaction, curing, and form stripping. Repairs made to correct defects in concrete work shall be included with this Bid item at no additional charge to the City. Payment for this item shall be on a lump sum basis.

15. Lift Station J Block Retaining Walls

Bid item lump sum bid pricing includes full compensation for all material, labor, equipment, tools, and services costs required to provide gravity block retaining walls around the new Lift Station J electrical panel and around the existing PG&E vault at the Lift Station J Site as shown on the

contract plans. Included in this bid item is excavation, compaction, base rock, block, wall rock, drain rock, filter fabric, and backfill to the lines and grades indicated on the contract plans and specification.

16. Lift Station J Complete Electrical Installation

The lump sum bid price for this item shall include all required material, equipment and labor necessary to furnish and install all electrical components for Lift Station J as detailed on the plans, including but not limited to the new PG&E service, complete power distribution system, diesel engine-driven generator set with enclosure and fuel tank, automatic transfer switch, and new power and control pedestal. Included in this bid item is the installation of the degreasing system, including boxes, conduit, and tubing, as indicated in the contract documents. Also included are all conductors, conduits, pull boxes and junction boxes and all control elements, including devices and wiring. Site lighting, including pole and foundation, are also included in this bid item. Also included in this bid item is all Work required to file for and obtain a City Building Permit. The City shall be responsible for the City Building Permit fees. Also included in this bid item are any electrical elements necessary for a complete electrical installation. This bid item includes coordination with the City for installation of SCADA equipment to match the City's existing system as indicated on the contract documents.

17. Lift Station J Removable Guard Posts

This lump sum Bid item constitutes full payment for all materials, equipment and labor necessary to construct removable guard posts protecting the Lift Station J generator as shown on the contract plans. This Bid item includes full compensation for constructing the posts complete and in-place, including postholes, hardware, concrete placement and compaction, and curing. Payment for this item shall be on a lump sum basis.

18. Lift Station J Asphaltic Concrete Paving

The lump sum price bid price for this item shall constitute full compensation for all materials, equipment and services needed to complete the installation of the asphaltic concrete pavement, including compaction and the installation of base rock, at the Lift Station J site as indicated on the contract plans. Also included in this bid item is the replacement of paving over any required trenching areas, demolition areas, and any other areas where the existing pavement is removed or damaged by the Work of this Project. Replacement of any asphaltic concrete berm removed or damaged by the Work of this Project is included in this bid item.

19. Lift Station J Base Rock Ground Cover

The lump sum price bid price for this item shall constitute full compensation for all materials, equipment and services needed to complete the installation of base rock ground cover at the Lift Station J site around the new generator concrete slab and miscellaneous areas as indicated on the contract plans.

20. Lift Station W Mobilization/Demobilization

The lump sum bid price for this item shall constitute full compensation for preparatory work and operations, including but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the project sites; for the establishment of all field offices, fencing and other facilities necessary for work on the Project at Lift Station W; and for all other work and operations which must be performed or costs incurred prior to beginning work on the various contract items on the project site. This bid item also includes demobilization at the completion of work.

21. Lift Station W Excavation Protection

This Bid item includes all work necessary to comply with OSHA, Cal OSHA, and California Labor Code Section 6707 including the preparation of an excavation safety plan at Lift Station W. Measurement for this item will be equal to the percentage of grading and excavation completed as specified herein and as estimated by the City. This Bid item shall include full compensation for completion of all planning, design, engineering fees, furnishing and construction, and removal and disposal of such temporary sheeting, shoring and bracing, complete, as required under the provisions of any permits, and in accordance with the requirements of OSHA and the Construction Safety Orders of the State of California, pursuant to the provisions of Sections 6700 through 6708 of the California Labor Code. Payment for this item shall be on a lump sum basis.

22. Lift Station W Bypass Pumping and Piping

The lump sum bid price for this item shall constitute full compensation for providing all materials, labor, tools, equipment, services and power to provide adequate pumping of sanitary sewage at Lift Station W throughout construction. Sewage service must be maintained at all times and the Contractor shall be responsible for providing adequate pumping capacity.

23. Lift Station W Demolition

The lump sum bid for this item includes all required labor, materials and equipment to demolish, remove, transport, and dispose of all items designated for removal on the contract plans at the Lift Station W Site. These items include, but are not limited to; existing electrical panels, site lighting equipment, pumps and accessories, sewer pipe and fittings, hose bib, concrete slabs, valve vault, and concrete boxes as indicated in the contract documents. This bid item shall include all excavation, backfill, and surface restoration as required. Items to be salvaged shall be cleaned and transported to the designated location at no additional cost to the City.

24. Lift Station W Pumps & Base Elbows

This bid item includes all costs, materials and labor required to furnish and install sewage pumps and pump base elbows at Lift Station W in accordance with this contract. It will be paid on a per pump basis.

25. Lift Station W Spare Pump

This bid item includes all costs, materials, and labor required to furnish a spare sewer pump for use at Lift Station W in accordance with this contract. It will be paid on a per pump basis.

26. Lift Station W Miscellaneous Pump Equipment

The lump sum price bid for this item shall constitute full compensation to provide labor, materials and equipment necessary to provide a fully functioning pumping installation, including, pump guide rails, pump guiderail brackets, pump lifting chains, and intermediate guide rail supports. The lump sum price for this bid item includes the miscellaneous pump equipment for both pumps in Lift Station W.

27. Lift Station W Piping, Fittings, and Valves

The lump sum price for this item shall include all materials, labor and equipment required to furnish and install all pump discharge piping, valves and fittings, at Lift Station W as called out on the contract plans. Included in this bid item is the installation of all piping, fittings, valves, supports and accessories from the pump discharge within the wet well to the elbow just outside of the valve vault for connection to the force main.

28. Station W New Force Main

The unit price bid per linear foot for this item shall include all materials, labor and equipment needed to furnish and install the PVC sanitary sewer force main pipe at Station 2 from the elbow just outside of the valve vault to the connection to the existing force main as indicated in the contract documents. This bid item shall include potholing and utility investigation to field-locate the existing force main for the connection of the new force main. This bid item shall also include all required pipe, fittings, accessories, backfill, excavation, bedding material, surface restoration and other materials required to furnish a complete and functioning sanitary sewer force main pipe.

29. Lift Station W Wet Well Improvements

The lump sum price bid for this item shall include all labor, equipment and materials required to provide and install all required wet well improvements to Lift Station W. Included are improvements to the invert of the wet well structure, including the formation of a trough sump as shown on the contract plans.

The coating of the wet well shall not be included in this bid item. (The coating of the wet well shall be included in Bid Item 30 – Lift Station W Wet Well Coating.)

30. Lift Station W Wet Well Coating

The unit price bid per wet well for this item shall include all labor, equipment and materials required to provide and install a coating system on the interior of the Lift Station W wet well in accordance with these Specifications. This Bid item includes all necessary surface preparation

measures and all other work required to achieve a complete coating system.

31. Lift Station W Sanitary Sewage Storage Vault Coating

The unit price bid per wet well for this item shall include all labor, equipment and materials required to provide and install a coating system on the interior of the Lift Station W sanitary sewage storage vault located to the south of Lift Station W wet well in accordance with these Specifications. This Bid item includes all necessary surface preparation measures and all other work required to achieve a complete coating system.

32. Lift Station W Precast Concrete Valve Vault

The lump sum bid price for this item shall include all labor, equipment and materials required to furnish and install a traffic-rated precast concrete valve vault at Lift Station W, including the specified traffic-rated access hatch, drain rock, and geotextile.

33. Lift Station W Electrical Panel Concrete Slab

This bid item includes concrete and reinforcement required to construct the poured-in-place concrete slab supporting the Lift Station W electrical panel as shown on the contract plans. This Bid item includes full compensation for constructing the concrete slab complete and in-place, including base rock, form work, steel reinforcement, concrete placement and compaction, curing, and form stripping. Repairs made to correct defects in concrete work shall be included with this Bid item at no additional charge to the City. Payment for this item shall be on a lump sum basis.

34. Lift Station W Canopy

This bid item includes all required design, material, equipment and labor necessary to furnish and install the canopy to shelter the Lift Station W electrical panel as shown on the contract plans and described in the specifications. This Bid item includes full compensation for constructing the canopy, including framing, roofing, and anchorage, complete and in-place, including design, fabrication, coating, and installation. Payment for this item shall be on a lump sum basis.

35. Lift Station W Complete Electrical Installation

The lump sum price for this item shall include all required material, equipment and labor necessary to furnish and install all electrical components for Lift Station W as detailed on the plans, including but not limited to the new PG&E service, complete power distribution system, and new power and control pedestal. Included in this bid item is the installation of the degreasing system, including boxes, conduit, and tubing, as indicated in the contract documents. Also included are all conductors, conduits, pull boxes and junction boxes and all control elements, including devices and wiring. Site lighting, including pole and foundation, are also included in this bid item. Also included in this bid item is all Work required to file for and obtain a City Building Permit. The City shall be responsible for the City Building Permit fees. Also included in this bid item are any

electrical elements necessary for a complete electrical installation. This bid item includes coordination with the City for installation of SCADA equipment to match the City's existing system as indicated on the contract documents.

36. Lift Station W Hose Bib and Stand

The lump sum price bid price for this item shall include all materials, labor and equipment needed to furnish and install a new hose bib and hose stand at Lift Station W as shown on the contract plans. This bid item shall include all required piping and fittings, backfill, excavation, bedding material and other materials required to furnish a complete and functioning hose bib and stand conforming to City standards.

1.05 CONTRACTOR'S COST BREAKDOWN

- A. The Contractor shall submit a Schedule of Values to the City's Representative at the preconstruction conference. The price breakdown, as agreed upon by the Contractor and the City's Representative, shall be used for preparing future estimates for partial payments of lump sum items to the Contractor.
- B. The price breakdown shall be generally in the same format as the Contract specifications divisions and subdivisions, with major items of work listed individually. The price breakdown shall be by structural, civil, landscaping, or other logical division of work. The price breakdown shall include separate allowances for any testing and startup work required. Measurable approximate quantities of work performed by the Contractor or its subcontractors shall be provided. For quantities that are the sum total of several individual quantities, backup summaries shall be provided which list the individual descriptions and quantities. These summaries then will be used to determine the quantities of work in place in subsequent progress payment requests.
- C. The above is a statement of the intent of the Contract Documents to provide a moderate level of detail, acceptable to the City's Representative, to allow a fair and reasonable estimate to be made of the value of work installed. The detail of the price breakdown must be sufficient to provide timely processing of the monthly progress payment request.
- D. The price breakdown will be subject to the approval of the City's Representative, and upon request, the Contractor shall substantiate the price for any or all items and provide additional level of detail, including quantities of work. The price breakdown shall be sufficiently detailed to permit its use by the City's Representative as one of the bases for evaluating requests for payments. The City's Representative shall be the sole judge of the adequacy of the price breakdown.
- E. The Schedule of Values shall be solely used to determine progress payments. The Schedule of Values shall not be considered in determining payment or credit for additional or deleted work.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

**SECTION 01330
SUBMITTAL PROCEDURES**

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Requirements and procedures for submitting Shop Drawings, Product Data, Samples, other submittals relating to products, and as specified in individual sections.
- B. Related Sections:
 - 1. Section 01600 - Product Requirements.

1.02 DEFINITIONS

- A. Manufacturer's Instructions: Instructions, stipulations, directions, and recommendations issued in printed form by the manufacturer of a product addressing handling, installation, erection, and application of the product; Manufacturers Instructions are not prepared especially for the Work.
- B. Shop or Fabrication Drawings: Drawings, diagrams, schedules, and other data specially prepared for the Work to illustrate some portion of the Work in detail sufficient for actual fabrication.
- C. Design Calculations: Detailed calculations relating to structural, mechanical or electrical design as called for in the relevant technical specification section, or as necessary for the preparation of detailed fabrication drawings.
- D. Product Data: Illustrations, standard schedules, performance charts, brochures, diagrams and other information to illustrate materials or equipment for some portion of the Work.
- E. Samples: Physical examples which illustrate materials, equipment, or workmanship and establish standards by which the Work will be judged.
- F. Special Samples: Physical examples which illustrate materials, equipment, or workmanship and establish standards by which the Work will be judged, and will be incorporated in the Work.

1.03 SUBMITTAL PROCEDURES

- A. Deliver submittals to ENGINEER at address listed on cover of Project Manual, unless another mutually agreeable place is designated.
- B. Submit submittals in ample time for each to serve submittals' intended purpose.
- C. Submit submittals which are specified or reasonably required for construction, operation, and maintenance of the Work.

- D. All submittals shall be accompanied by the standard "CONTRACTOR'S SUBMITTAL TRANSMITTAL" form (Section 1.04). Any submittal not accompanied by such a form, or where all applicable items on the form are not completed, or are incorrectly completed, may be returned at the ENGINEER'S discretion for resubmittal.
- E. Submit specified number of copies of submittal.
- F. Provide or furnish products and execute the Work in accordance with accepted submittals, unless in conflict with Contract Documents.
- G. When minor deviations from Contract Documents are accepted, modify Contract Documents in accordance with the Conditions of the Contract.

1.04 SUBMITTAL FORM

- A. Each submittal transmittal form shall identify:
 - 1. Submittal date.
 - 2. Project and CONTRACTOR.
 - 3. Subcontractor and major supplier, when appropriate.
 - 4. Reference submittal to Contract Documents by Drawing, detail, and/or Specification section numbers, as appropriate.
 - 5. Variations from Contract Documents when variations are included in submittal.
- B. Normally, a separate transmittal form shall be used for each specific item or class of material or equipment for which a submittal is required. Transmittal of a submittal of various items using a single transmittal form will be permitted only when the items taken together constitute a manufacturer's "package" or are so functionally related that expediency indicates a review of the group or package as a whole. A multiple-page submittal shall be collated into sets, and each set shall be stapled or bound, as appropriate, prior to transmittal to the ENGINEER.
- C. All submittal forms and submittals shall be in English.

1.05 SUBMITTAL LIST

- A. Furnish a schedule and list of all required submittals to the ENGINEER, including required submittals by all subcontractors.

1.06 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

- A. Submit Shop Drawings, Product Data, Samples, and other pertinent information in sufficient detail to show compliance with specified requirements.
- B. Shop Drawings shall show in detail the size, sections, and dimensions of all the member(s); the arrangement and construction of all connections and joints; all holes, straps, and other fittings required for attaching work and other pertinent details. When required, engineering computations shall be submitted. The

CONTRACTOR shall be responsible for delivering reviewed copies of Shop Drawings to all others whose work is dependent thereon.

- C. The CONTRACTOR shall maintain at the site of the Project, at all times, a complete file of approved Shop Drawings and manufacturers' data for this Project.
- D. Check, verify, and revise submittals as necessary to bring them into conformance with Contract Documents and actual field conditions.
 - 1. Determine and verify quantities, dimensions, specified design and performance criteria, materials, catalog numbers, and similar data.
 - 2. Coordinate submittal with other submittals and with the requirements of the Contract Documents.
- E. After completion of checking, verification, and revising; stamp, sign and date submittals indicating review and approval; and submit to ENGINEER.
 - 1. Stamp and signature indicates CONTRACTOR has satisfied shop drawing review responsibilities and constitutes CONTRACTOR's written approval of shop drawing.
 - 2. Shop drawings without CONTRACTOR's written approval will be returned for resubmission.
- F. Shop and Fabrication Drawings: Submit six (6) copies.
- G. Product Data and Manufacturer's Instructions: Submit six (6) copies. Excise or cross out non-applicable information and clearly mark applicable information with citations to and terminology consistent with Contract Documents.
- H. Samples: Submit two (2) samples labeled with reference to applicable Contract Documents. Label will be returned with reviewer's selection when appropriate, comments and stamp. Samples will not be returned unless return is requested in writing and additional sample is submitted.
- I. Special Samples: Submit one (1) sample labeled with reference to applicable Contract Documents. Sample and one label will be returned for installation in the Work.
- J. Assume risk of expense and delays when proceeding with work related to required submittals without review and acceptance.

1.07 MANUFACTURER'S INSTRUCTIONS

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

1.08 CERTIFICATES OF COMPLIANCE

- A. Certificates of Compliance should provide the following information:
1. Name of supplier;
 2. Type of material being supplied and quantity of material available;
 3. A statement that material being supplied complies in all respects with the requirements of the specifications;
 4. Copies of test results from a qualified testing laboratory which supports the statement provided above.
- B. All materials used on the basis of a Certificate of Compliance may be sampled and tested at any time by the ENGINEER. The fact that material is used on the basis of a Certificate of Compliance shall not relieve the CONTRACTOR of responsibility for incorporating material in the Work which conforms to the requirements of the Drawings and Specifications and any such material not conforming to such requirements will be subject to rejection whether in place or not.

1.09 ENGINEER'S REVIEW

- A. ENGINEER's review of submittals shall not release CONTRACTOR from CONTRACTOR's responsibility for performance of requirements of Contract Documents. Neither shall ENGINEER's review release CONTRACTOR from fulfilling purpose of installation nor from CONTRACTOR's liability to replace defective work.
- B. Do not consider submittals as Contract Documents. Purpose of submittals is to demonstrate how CONTRACTOR intends to conform to the design concepts.
- C. ENGINEER's review of shop drawings, samples, or test procedures will be only for conformance with design concepts and for compliance with information given in Contract Documents.
1. ENGINEER's review does not extend to:
 - a. Accuracy of dimensions, quantities, or performance of equipment and systems designed by CONTRACTOR.
 - b. CONTRACTOR's means, methods, techniques, sequences, or procedures except when specified, indicated on the Drawings, or required by Contract Documents.
 - c. Safety precautions or programs related to safety which shall remain the sole responsibility of the CONTRACTOR.
- D. Except as may be provided in subsequent specifications, a submittal will be returned within 30 days with appropriate comments if required.
1. When a submittal cannot be returned within that period, ENGINEER will, within a reasonable time after receipt of the submittal, give notice of the date by which that submittal will be returned.

- E. ENGINEER will be entitled to rely upon the accuracy or completeness of designs, calculations, or certifications made by licensed professionals accompanying a particular submittal whether or not a stamp or seal is required by Contract Documents or Laws and Regulations.
- F. Costs incurred by CITY as a result of additional reviews of a particular submittal after the second time it has been reviewed shall be borne by CONTRACTOR. Reimbursement to CITY will be made by deducting such costs from CONTRACTOR's subsequent partial payments.

1.10 SUBMITTAL REVIEW PROCEDURES

- A. It is considered reasonable that the CONTRACTOR shall make a complete and acceptable submittal to the ENGINEER by the second submission of a submittal item. The CITY reserves the right to withhold moneys due the CONTRACTOR to cover additional costs of the ENGINEER'S review beyond the second submittal. Submittal will be returned to the CONTRACTOR with one of three (3) markings:
 - 1. If three (3) copies of a submittal are returned to the CONTRACTOR marked "NO EXCEPTIONS TAKEN/PROCEED," formal revision and resubmission of said submittal will not be required.
 - 2. If three (3) copies of a submittal are returned to the CONTRACTOR marked "MAKE CORRECTIONS NOTED/PROCEED CONDITIONALLY" formal revision and resubmission of said submittal will not be required
 - 3. If one (1) copy of a submittal is returned to the CONTRACTOR marked "REJECTED-RESUBMIT/DO NOT PROCEED," the CONTRACTOR shall revise said submittal and shall resubmit six (6) copies of said revised submittal to the ENGINEER.
- B. All Work for which Shop Drawings are required shall be performed in accordance with the reviewed and approved copies. Fabrication of an item shall not commence before the ENGINEER has reviewed the pertinent submittal and returned the copies to the CONTRACTOR marked either "NO EXCEPTIONS TAKEN/PROCEED," or "MAKE CORRECTIONS NOTED/PROCEED CONDITIONALLY." Revisions indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as the basis for claims for extra work.
- C. All CONTRACTOR submittals shall be carefully reviewed by an authorized representative of the CONTRACTOR prior to submission to the ENGINEER. Each submittal shall be dated, signed, and certified by the CONTRACTOR as being correct and in strict conformance with the Contract Documents. No consideration for review by the ENGINEER of any CONTRACTOR'S submittal will be made for any items which have not been so certified by the CONTRACTOR. All noncertified submittals will be returned to the CONTRACTOR without action taken by the ENGINEER, and any delays caused thereby shall be the total responsibility of the CONTRACTOR.
- D. Should the Shop Drawings or manufacturers data (for submittals required by the Standard Specifications or the specifications) show variations from the Contract

requirements, the CONTRACTOR shall make specific mention of such variations in the letter of transmittal, in order that, if acceptable, suitable action may be taken for proper adjustment of the Contract; otherwise the CONTRACTOR will not be relieved of the responsibility for executing the work in accordance with the Contract Documents, and the approved submittals.

1.11 MINOR OR INCIDENTAL PRODUCTS AND EQUIPMENT SCHEDULES

- A. Shop Drawings of minor or incidental fabricated products will not be required, unless requested.
- B. Submit tabulated lists of minor or incidental products showing the names of the manufacturers and catalog numbers, with Product Data and Samples as required to determine acceptability.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

**SECTION 01600
PRODUCT REQUIREMENTS**

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Product requirements; product selection; products schedule; products substitution; execution; manufacturer's instructions; and delivery, handling, and storage.
- B. Related Sections
 - 1. Section 01330 - Submittal Procedures.

1.02 PRODUCT REQUIREMENTS

- A. Comply with Specifications and referenced standards as minimum requirements.
- B. Provide products by same manufacturer when products are of similar nature, unless otherwise specified.
- C. Provide identical products when products are required in quantity.
- D. Provide products with interchangeable parts whenever possible.
- E. Require each equipment manufacturer to have maintenance facilities meeting the following requirements:
 - 1. Minimum 3 years operational experience.
 - 2. Equipment and tools capable of making repairs.
 - 3. Staff qualified to make repairs.
 - 4. Inventory of maintenance spare parts.

1.03 PRODUCT SELECTION

- A. When products are specified by standard or specification designations of technical societies, organizations, or associations only, provide products which meet or exceed reference standard and Specifications.
- B. When products are specified with names of manufacturers but no model numbers or catalog designations, provide:
 - 1. Products by one of named manufacturers which meet or exceed Specifications.
 - 2. Accepted or-equals.

- C. When products are specified with names of manufacturers and model numbers or catalog designations, provide:
 - 1. Products with model numbers or catalog designations by one of named manufacturers.
 - 2. Accepted or-equals.
- D. When products are specified with brand or trade names, model numbers, or catalog designations by one manufacturer (or equal) only, provide:
 - 1. Products specified by brand or trade name, model number, or catalog designation.
 - 2. Products by named manufacturers proven in accordance with requirements for or-equals to meet or exceed quality, appearance and performance of specified brand or trade name, model number, or catalog designation.
 - 3. Accepted or-equals.

1.04 QUALITY ASSURANCE

- A. Employ entities that meet or exceed specified qualifications to execute the Work.
- B. Inspect conditions before executing subsequent portions of the Work. Accept responsibility for correcting unsatisfactory conditions upon executing subsequent portions of the Work.
- C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1.05 DELIVERY, HANDLING, AND STORAGE

- A. Prepare Products for Shipment by:
 - 1. Applying grease and lubricating oil to bearings and similar items.
 - 2. Separately packing or otherwise suitably protecting bearings.
 - 3. Tagging or marking products to agree with delivery schedule or Shop Drawings.
 - 4. Including complete packing lists and bills of material with each shipment.
 - 5. Packaging products to facilitate handling and protection against damage during transit, handling and storage.
- B. Transport products by methods that avoid product damage. Deliver products in undamaged condition in manufacturer's unopened containers or packaging.
- C. Provide equipment and personnel to handle products by methods to prevent soiling or damage.

- D. Upon delivery, promptly inspect shipments. Verify compliance with Contract Documents, correct quantities and undamaged condition of products. Immediately store and protect products and materials until installed in Work.
- E. Store products with seals and legible labels intact.
- F. Store moisture sensitive products in weathertight enclosures.
- G. Maintain products within temperature and humidity ranges required or recommended by manufacturer.
- H. Connect and operate space heaters during storage when ambient temperatures fall below temperatures recommended by manufacturer.
- I. Protect painted surfaces against impact, abrasion, discoloration, and other damage. Repaint damaged painted surfaces.
- J. Exterior Storage of Fabricated Products:
 - 1. Place on above ground supports which allow for drainage.
 - 2. Cover products subject to deterioration with impervious sheet covering.
 - 3. Provide ventilation to prevent condensation under covering.
- K. Store loose granular materials on solid surfaces in well-drained area. Prevent materials mixing with foreign matter.
- L. Provide access for inspection.

1.06 PRODUCT SUBSTITUTIONS

- A. The CONTRACTOR may supply any of the materials specified or offer an equivalent. The ENGINEER shall determine whether the material offered is equivalent to that specified. The CONTRACTOR shall make all "Or Equal" submittals within thirty (30) calendar days after issuance of Notice to Proceed. Any request or submittal received after the specified period will be considered as NOT EQUAL to that so specified and will be processed as a substitution described hereinafter.
- B. Whenever any particular material, process, or equipment is indicated by patent, proprietary or brand name, or by name of manufacturer, such wording is used for the purpose of facilitating its description and shall be deemed to be followed by the words 'or equal.' A listing of materials is not intended to be comprehensive, or in order of preference. The CONTRACTOR may offer any material, process, or equipment considered to be equivalent to that indicated. The substantiation of offers shall be submitted as provided in the Contract Documents.
- C. The CONTRACTOR shall, at its expense, furnish data concerning items offered by it as equivalent to those specified. The CONTRACTOR shall have the material tested as required by the ENGINEER to determine that the quality, strength, physical, chemical, or other characteristics, including durability, finish,

efficiency, dimensions, service, and suitability are such that the items will fulfill its intended function.

- D. Test methods shall be subject to the approval of the ENGINEER. Test results shall be reported promptly to the ENGINEER, who will evaluate the results and determine if the substitutes are equivalent. The ENGINEER'S findings shall be final. Installation and use of a substitute items shall not be made until approved by the ENGINEER.
- E. All manufacturers' data submitted to the ENGINEER for review and acceptance shall clearly identify each proposed substitute with the corresponding Contract Drawing detail and Specification Section. If the ENGINEER decides to accept for use in the Project a material, process or article which is not the equal of that specified, substitution shall be made in the manner described in Section 01254 "Payment For Changes And Extra Work", with a credit to the CITY for the difference in value.
- F. The ENGINEER shall determine whether the material offered is equivalent to that specified. Any revision to structures, piping, mechanical, electrical, instrumentation, or any other work made necessary by such substitution must be approved by the ENGINEER, and the entire cost both direct and indirect of these revisions shall be borne by the CONTRACTOR.
- G. Any materials, process, or article may be requested as a substitution by the CONTRACTOR, in lieu of that specified, under the following conditions:
 - 1. Requests must be submitted in writing and in the manner described in Section 01330.
 - 2. Requests must be submitted thirty (30) calendar days prior to starting the work involved, as established by the ENGINEER, so as not to cause any delay in completion of the Project. No other request will be considered after expiration of the period specified, except that in exceptional cases where it is determined to be in the best interest of the CITY, as approved by the ENGINEER.
 - 3. The CONTRACTOR agrees to pay for all engineering and design services, if required, to make all changes and adjustments in material and work of all trades directly or indirectly affected by the substitute, to the satisfaction of the ENGINEER, at no cost to the CITY.
 - 4. All requests for substitution shall be made through the CONTRACTOR. Submissions by the CONTRACTOR shall imply the CONTRACTOR'S approval of such substitution.
 - 5. No requests for substitutions will be considered during the bidding period.
 - 6. The CONTRACTOR shall furnish adequate data with each request for approval of a substitute to enable the ENGINEER to evaluate the proposed substitution.
 - 7. If a substitute offered by the CONTRACTOR is not found to be equal to the specified material, then CONTRACTOR shall furnish and install the specified material.

8. The specified Contract completion time shall not be affected by any circumstance developing from the provisions of this Section.

1.07 MANUFACTURER'S INSTRUCTIONS

- A. Deliver, handle, store, install, erect, or apply products in accordance with manufacturer's instructions, Contract Documents and industry standards.
- B. Periodically inspect to assure products are undamaged and maintained under required conditions.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

**SECTION 01782
OPERATING AND MAINTENANCE DATA**

PART 1 GENERAL**1.01 SUMMARY**

- A. Section Includes: Preparation and submittal of Operation and Maintenance Manuals.
- B. Related Sections:
 - 1. Section 11320 – Submersible Pumps.
 - 2. Section 16427 – Power Pedestals.
 - 3. Section 16630 – Engine-Generator Set.
 - 4. Section 16635 – Automatic Transfer Switch.

1.02 SUBMITTALS

- A. Submit Operation and Maintenance Manuals as part of the shop drawing approval process.
- B. Make additions and revisions to the Manuals in accordance with Engineer's review comments.
- C. Submit four (4) complete Manuals for each piece of equipment or system after shop drawing approval.

1.03 OPERATION AND MAINTENANCE MANUALS

- A. Preparation:
 - 1. Provide Operations and Maintenance Manuals in 3-ring binders with rigid covers. Utilize tab sheets to organize information.
- B. Contents of Operation And Maintenance Manuals:
 - 1. Cover Page: Equipment name, equipment tag number, project name, CITY's name, appropriate date.
 - 2. Table of Contents: General description of information provided within each tab section.
 - 3. Lubrication Information: Required lubricants and lubrication schedules.
 - 4. Control Diagrams:
 - a. Internal and connection wiring, including logic diagrams, wiring diagrams for control panels, ladder logic for computer based systems, and connections between existing systems and new additions, and adjustments such as calibrations and set points for relays, and control or alarm contact settings.

5. Start-up Procedures: Recommendations for installation, adjustment, calibration, and troubleshooting.
6. Operating Procedures:
 - a. Step-by-step procedures for starting, operating, and stopping equipment under specified modes of operation.
 - b. Include safety precautions and emergency operating shutdown instructions.
7. Preventative Maintenance Procedures: Recommended steps and schedules for maintaining equipment.
8. Overhaul Instructions: Directions for disassembly, inspection, repair and reassembly of the equipment; safety precautions; and recommended tolerances, critical bolt torques, and special tools that are required.
9. Parts List: Generic title and identification number of each component part of equipment; include bearing manufacturer, model and ball or roller pass frequencies for every bearing.
10. Spare Parts List: Recommended number of parts to be stored at the site and special storage precautions.
11. Drawings: Exploded view or plan and section views with detailed callouts.
12. Provide electrical and instrumentation schematic record drawings.
13. Provide approved shop and fabrication drawings.
14. Equipment Summary Form: Completed form in the format attached at the end of this Section. Insert Equipment Summary Form after the tab sheet of each equipment section. The manufacturer's standard form will not be acceptable.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

EQUIPMENT SUMMARY FORM

- 1. EQUIPMENT ITEM _____
- 2. MANUFACTURER _____
- 3. EQUIPMENT IDENTIFICATION NUMBER(S) _____
(maps equipment number)
- 4. LOCATION OF EQUIPMENT _____
- 5. WEIGHT OF INDIVIDUAL COMPONENTS (OVER 100 POUNDS) _____

NAMEPLATE DATA -

- Horsepower _____
- Amperage _____
- Voltage _____
- Service Factor (S.F.) _____
- Speed _____
- ENC Type _____
- Capacity _____
- Other _____

- 7. MANUFACTURER'S LOCAL REPRESENTATIVE
Name _____
Address _____
Telephone Number _____
- 8. MAINTENANCE REQUIREMENTS _____

- 9. LUBRICANT LIST _____

- 10. SPARE PARTS (recommendations) _____

- 11. COMMENTS _____

SECTION 02260
EXCAVATION SUPPORT AND PROTECTION

PART 1 GENERAL**1.01 SUMMARY**

- A. Section Includes: Requirements for designing, furnishing and installing, maintaining, and removing excavation support and protection.
- B. Related Sections:
 - 1. Section 02300 - Earthwork.
 - 2. Section 02318 – Trenching.

1.02 REFERENCES

- A. American Institute of Steel Construction, Inc. (AISC):
 - 1. Manual of Steel Construction Allowable Stress Design.
- B. American Society of Civil Engineers:
 - 1. Guidelines of Engineering Practice for Braced and Tied-Back Excavations.
- C. California Code of Regulations (CCR):
 - 1. Title 8 - Construction Safety Orders.
- D. California Labor Code Sections 6705 to 6707 (CLC).
- E. Department of the Navy Naval Facilities Engineering Command (NAVFAC):
 - 1. NAVFAC Design Manual 7.2 - Foundations and Earth Structures.
 - 2. NAVFAC Design Manual 7.3 - Soil Dynamics Deep Stabilization and Special Geotechnical Construction.
- F. International Conference of Building Officials (ICBO):
 - 1. California Building Code (CBC).
- G. State of California Department of Transportation (CALTRANS):
 - 1. CALTRANS California Trenching and Shoring Manual.
- H. United States Steel Corporation (USS):
 - 1. USS Steel Sheet Piling Design Manual.

1.03 DEFINITIONS

- A. General Engineering Design Practice: General engineering design practice in area of the Project, performed in accordance with recent engineering literature on subject of shoring and stability of excavations.

- B. Shoring: A temporary structural system designed to support vertical faces, or nearly vertical faces, of soil or rock for purposes of excavation. Shoring includes internally braced sheet piling, slurry walls, soldier piles and lagging, and other similar shoring systems. Sloping of the soil is not shoring.

1.04 CONTRACTOR'S RESPONSIBILITIES

- A. CONTRACTOR assumes full and complete responsibility for excavation support and protection, including shoring design and installation.
- B. The review of CONTRACTOR's shoring system design, submittals and/or installations by the ENGINEER does not relieve CONTRACTOR of his responsibility for excavation safety. This requirement shall apply continuously and is not limited to normal working hours.
- C. CONTRACTOR's reliance upon documents furnished by CITY does not provide relief from these requirements.

1.05 SYSTEM DESCRIPTION

- A. Where General Engineering Design Practice is specified, provide drawings and signed calculations and have design performed by civil or structural engineer registered in California.
 - 1. Provide design calculations that clearly disclose assumptions made, criteria followed, and stress values used for the materials being used.
 - 2. Furnish references acceptable to ENGINEER substantiating appropriateness of design assumptions, criteria, and stress values.
- B. Design Requirements:
 - 1. General:
 - a. Design means for safe and stable excavations in accordance with general engineering design practice.
 - 1) The preceding requirement shall not apply to trench excavation support conforming to standards set forth in CCR Title 8 - Construction Safety Orders.
 - b. Design steel members in accordance with the California Building Code and the AISC Manual of Steel Design.
 - c. Design shoring involving materials other than steel in accordance with California Building Code.
 - d. Design all shoring and sheeting systems to resist additional lateral loads including loads induced by construction equipment or material stockpiles near the top of excavation.
 - e. When electing to design with material stresses for temporary construction higher than allowable stresses prescribed in the Manual of Steel Construction and the California Building Code, increase in such stresses shall not exceed 10 percent of value of prescribed stresses.

- f. Minimum safety factor used for design shall not be less than 1.5.
- g. The calculated minimum depth of penetration of shoring below the bottom of the excavation shall be increased not less than 30 percent if the full value of passive pressure is used in the design.
- h. The maximum height of cantilever shoring above the bottom of excavation shall not exceed 15 feet. Use braced shoring when the height of shoring above the bottom of excavation exceeds 15 feet.
- i. The location of the point of fixity for shoring shall not be less than half the calculated minimum embedment depth below the bottom of the excavation.
- j. Generally acceptable references for the design of shoring and excavations are as follows:
 - 1) CALTRANS California Trenching and Shoring Manual.
 - 2) NAVFAC Design Manual 7.2 - Foundations and Earth Design.
 - 3) NAVFAC Design Manual 7.3 - Soil Dynamics Deep Stabilization and Special Geotechnical Construction.
 - 4) USS Steel Sheet Piling Design Manual.
 - 5) Guidelines of Engineering Practice for Braced and Tied-Back Excavations published by American Society of Civil Engineers.
- k. Shoring design shall be performed by a Civil or Structural Engineer licensed to practice in California. Include costs for this shoring design in the bid.

C. Performance Requirements:

1. General:

- a. Support faces of excavations and protect structures and improvements in vicinity of excavations from damage and loss of function due to settlement or movement of soils, alterations in ground water level caused by such excavations, vibration associated with installation and removal of excavation support structures, and related operations.
- b. Herein Specified Provisions:
 - 1) Complement, but do not substitute or diminish, obligations of CONTRACTOR for the furnishing of a safe place of work pursuant to provisions of the Occupational Safety and Health Act of 1970 and its subsequent amendments and regulations and for protection of the Work, structures, and other improvements.
 - 2) Represent minimum requirement for:
 - a) Number and types of means needed to maintain soil stability.
 - b) Strength of such required means.
 - c) Methods and frequency of maintenance and observation of means used for maintaining soil stability.

- 2. Provide safe and stable excavations by means of sheeting, shoring, bracing, sloping, and other means and procedures, such as draining and recharging groundwater and routing and disposing of surface runoff, required to maintain the stability of soils and rock.

3. Provide support for trench excavations for protection of workers from hazard of caving ground.
4. Provide Shoring:
 - a. Where, as result of excavation work and analysis performed pursuant to general engineering design practice, as defined in this Section:
 - 1) Excavated face or surrounding soil mass may be subject to slides, caving, or other types of failures.
 - 2) Stability and integrity of structures and other improvements may be compromised by settlement or movement of soils, or changes in soil load on structures and other improvements.
 - b. For trenches 5 feet and deeper.
 - c. For trenches less than 5 feet in depth, when there is a potential for cave-in.
 - d. Where indicated on the Drawings.
5. For safe and stable excavations, use appropriate design and procedures for construction and maintenance to minimize settlement of supported ground and to prevent damage to structures and other improvements, including:
 - a. Using stiff support systems.
 - b. Following appropriate construction sequence.
 - c. Preventing soil loss through or under support system.
 - 1) Provide support system that is tight enough to prevent loss of soil and extend deep enough to prevent heave or flow of soils from supported soil mass into the excavation.
 - d. Providing surface runoff routing and discharge away from excavations.
 - e. Where dewatering is necessary, recharge groundwater as necessary to prevent settlement in area surrounding excavation.
 - f. Where sheet piling is used, use interlocking type sheets including interlocking corners. The sheet piles shall be continuous and driven in interlock. If the bottom of the excavation is located below the water table, use "thumb and finger" type interlock.
 - g. Not applying shoring loads to existing structures and other improvements.
 - h. Not changing existing soil loading on existing structures and other improvements.
 - i. Provide welded steel packing between soil retaining members such as sheet piles and wales and similar members when the gap exceeds 1/2 inch before the wales are loaded.
6. Do not use cantilever sheet pile shoring. When sheet piling is used, provide a braced system with a minimum of 2 levels of wales and braces. Locate top level of wales and bracing within 5 feet of the top of the sheets.

7. Use template for driving sheet piles to minimize need for pulling and re-driving sheet piles in the attempt to drive them plumb in areas where bay mud is present.

1.06 SUBMITTALS

A. Shop Drawings and Calculations:

1. In accordance with requirements in California Labor Code for trench excavations 5 feet or more in depth and for trenches less than 5 feet in depth when there is potential for cave-in. Submit in advance of excavation work, detailed drawings showing means for safe and stable excavations.
 - a. Where such drawings vary from excavation support standards set forth in California Code of Regulations Title 8 - Construction Safety Orders, submit design calculations pursuant to general engineering design practice.
 - b. Provide means for safe and stable excavations that are not less effective than required in CCR Title 8 - Construction Safety Orders.
2. For excavations other than trenches, submit, in advance of excavation work, design calculations as performed pursuant to general engineering design practice, as specified in this Section, and detail drawing showing means for safe and stable excavations. In design calculations and detail drawing, cover, as a minimum:
 - a. Excavations adjacent to structures and other improvements, and
 - b. Excavations 5 feet or more in depth, or less than 5 feet in depth when there is potential for cave-in, at other locations.
3. Submit Following:
 - a. Provide calculations for the different load, support, and other conditions that occur during the sequence of installation of shoring, construction of facilities protected by the shoring, and sequence of removal of shoring.
 - b. Provide sketches showing the condition at various stages of installation and removal of shoring.
 - c. Show structures, pipelines, and other improvements located near the shoring, and the shoring on a plan.
 - d. When utilities penetrate the shoring, submit an elevation of all sides of the shoring showing the locations of the penetrations. Submit details on ground support and sealing around utility penetrations.

- B. Detailed dewatering plan showing all proposed facilities to protect excavations from groundwater intrusion, methods of discharge.

C. Detailed Sequence of Installation and Removal of Shoring:

1. Consider effects of ground settlement in the sequence of installation and removal of shoring.

2. Provide sketches showing the conditions at various stages in the sequence of installation and removal of shoring.
 3. Clay and silt may stick to sheet piles when sheet piles are removed.
- D. Submit submittals for stability of excavations as a complete package and include all items required in this section. Incomplete submittals will not be reviewed and will be returned for resubmittal as a complete package. Complete submittal shall include all necessary information regarding the dewatering system as specified in Section 02300.

1.07 SEQUENCING AND SCHEDULING

- A. Do not begin work on excavations, trenches, and means for providing stability of excavation and trenches until submittals have been accepted by ENGINEER and until materials necessary for installation are on site.
- B. Submit submittals a minimum of 30 days prior to the scheduled date to begin excavation work.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 INSTALLATION AND REMOVAL

- A. Install means for providing safe and stable excavations as indicated in the submittals.
- B. Except for concrete encased soldier piles, slurry walls, and similar shoring systems, remove shoring by completion of the Work. Select shoring system and method of removal, which will minimize soil that sticks to shoring from creating large voids and causing settlement. To prevent settlement caused by pulling shoring, fill voids with sand, pea gravel, or pressure injected grout. The methods used shall prevent settlement. Pressure preservative treated wood lagging may be left in place when acceptable to the ENGINEER.

3.02 CONSTRUCTION DEWATERING

- A. It is expected that groundwater will be encountered during excavation for the pump station.
- B. Interlocking sheeting shall be used as necessary for excavation support, and to minimize groundwater flow into the excavations.
- C. The Contractor shall dewater all excavations using sump pumps or point wells as necessary, so as to accomplish all work in the dry.

1. Pumped groundwater shall be filtered through the crushed rock installed over the excavation bottom or otherwise filtered to produce a clean, non-turbid discharge.
2. Contractor shall submit a dewatering plan and receive written authorization prior to executing any dewatering actives.

3.03 MAINTENANCE

- A. Where loss of soil occurs, plug gap in shoring and replace lost soil with fill material acceptable to ENGINEER.

END OF SECTION

**SECTION 02300
EARTHWORK****PART 1 GENERAL****1.01 SUMMARY****A. Section Includes:**

1. Loosening, excavating, filling, grading, borrow, hauling, preparing subgrade, compacting in final location, wetting and drying, dewatering, and operations pertaining to site grading for buildings, basins, reservoirs, boxes, roads, and other structures.
2. Pumping and draining of excavations.
3. Backfilling and compacting around structures.

B. Related Sections:

1. Section 01330 - Submittal Procedures.
2. Section 02260 - Excavation Support and Protection.
3. Section 02318 - Trenching.
4. Section 02622 - Filter Fabric and Geotextiles.
5. Section 02722 - Aggregate Base Course.
6. Section 03300 - Cast-In-Place Concrete.

1.02 REFERENCES**A. Associated General Contractors (AGC):**

1. Manual of Accident Prevention in Construction (Section 9).

B. American Society for Testing and Materials (ASTM):

1. C 131 - Test Method for Resistance to Degradation of Small-Size Course Aggregate by Abrasion and Impact in the Los Angeles Machine.
2. C 136 - Test Method for Sieve Analysis of Fine and Course Aggregates.
3. D 422 - Standard Test Method for Particle - Size Analysis of Soils.
4. D 1556 - Test Method for Density and Unit Weight of Soil in Place by the Sand Cone Method.
5. D 1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m)).
6. D 2419 - Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
7. D 2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
8. D 3017 - Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

9. D 4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- C. Division of Industrial Safety (DIS).
- D. Institute of Makers of Explosives (IOMOE).
- E. Occupational Safety and Health Act (OSHA).
- F. State of California Department of Transportation (Caltrans).

1.03 DEFINITIONS

- A. Excavation: Consists of satisfactory loosening, removing, loading, transporting, depositing, and compacting in final location, wet and dry materials, necessary to be removed for purposes of construction, or as required for ditches, grading, roads, and such other purposes as are indicated on the Drawings.
- B. Backfill Adjacent to Structure: Is backfill around the exterior surfaces of a structure from the bottom of the excavation to finish grade.
- C. In-Place Density of Compacted Backfill: Is density determined in accordance with ASTM D 1556, or with ASTM D 2922 and ASTM D 3017.
- D. Maximum Density: Is maximum density obtained in laboratory when tested in accordance with ASTM D 1557.
- E. Definitions Related to Compaction of Coarse Fill:
 1. One Pass: Defined as one movement of roller over area being compacted.
 2. Measurement Of Pass Width: Measure width of pass between centers of outside tires or outside edge of roller wheel.
- F. Optimum Moisture Content: Is the optimum content at the maximum density when tested in accordance with ASTM D 1557.

1.04 SYSTEM DESCRIPTION

- A. Performance Requirements:
 1. General:
 - a. Obtain acceptable material from other sources if surplus or borrow materials obtained within project site do not conform to specified requirements or are not sufficient in quantity for structural backfill.
 - b. No extra compensation will be made for hauling of fill materials nor for water required to compact fills.
 2. Subgrade Preparation:
 - a. Where mud or other soft or unstable material is encountered, remove such material to a minimum of 12 inches. The bottom of the over-excavation should then be completely covered with geotextile and

backfilled with Class 2 aggregate base. The stabilization fabric should be wrapped around the backfill up to the bottom of the excavation.

3. Structural Backfill:
 - a. Material for Backfill:
 - 1) Use Class 2 Aggregate Base material to backfill below-grade retaining walls.
 - 2) Backfill material under other concrete structures, under pavement, or where heavy compaction equipment, such as a pneumatic tired roller, cannot be used satisfactorily shall consist of aggregate base course, except areas indicated on the Drawings as control density fill, lightweight aggregate or concrete encasement.
 - 3) Backfill in any area under concrete structures, shall extend from undisturbed native soil or rock to the bottom surface of the structure.
- B. Environmental Requirements:
 1. Keep excavations reasonably free from water.
 2. Provide standby power to ensure continuous dewatering in case of power failure.

1.05 SUBMITTALS

- A. General: Submit in accordance with Section 01330.
- B. Property Owner's Permission Agreements: Submit copy of property owner's agreements to allow placement of surplus material on their property.
- C. Product Data: Submit material source, gradation, and testing data for all materials, including imported and on-site materials.
- D. Excavation Plan: Submit proposed excavation plan in accordance with Section 02260.
- E. Test Reports: Submit certified test reports of all tests specified to be performed by the CONTRACTOR. Test reports shall be signed and sealed by a registered geotechnical engineer in the state of California.
- F. Dewatering Plan: Proposed dewatering plan including arrangement, location, and depths of system components, type, and sizes of filters, and required permits.

1.06 QUALITY ASSURANCE

- A. Initial Compaction Demonstration:
 1. Adequacy of Compaction Equipment and Procedures: Demonstrate adequacy of compaction equipment and procedures before exceeding any of following amounts of earthwork quantities:
 - a. 20 cubic yards of structural backfill.

2. Compaction Sequence Requirements: Until specified degree of compaction on previously specified amounts of earthwork is achieved, do not perform additional earthwork of the same kind.
 3. After satisfactory conclusion of initial compaction demonstration and at any time during construction, provide confirmation tests as specified under "FIELD QUALITY CONTROL."
- B. Regulatory Requirements: Assume responsibility for obtaining water discharge permits for any dewatering activities.
- C. Dispose of water from dewatering in such manner as not to be a menace to public health.

1.07 SEQUENCING AND SCHEDULING

- A. Schedule earthwork operations to meet requirements as provided in this Section for excavation and uses of excavated material.
- B. Excavation and Filling: Perform excavation and filling, during construction, in manner and sequence that provides drainage at all times.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Water for Compacting Fills: Use water from source acceptable to ENGINEER.
- B. Fill Materials:
1. General:
 - a. Provide aggregate base course, select material, bedding, engineered fill and native material, where required for fill and backfill.
 - b. Obtain material for fills from cut sections or from borrow sources.
 - c. Provide material having maximum particle size not exceeding 1 inch and that is free of trash, lumber, debris, leaves, grass, roots, stumps, and other vegetable matter.
 - d. Fill materials provided shall be free of environmental contaminants.
 - e. Materials derived from processing demolished or removed asphalt concrete are not acceptable.
 2. Crushed Rock: Crushed rock for mat foundation underlayment and where necessary to stabilize excavation bottoms shall be a clean, durable uniformly graded rock between ½ inch and 1½ inch size.
 3. Aggregate Base Course: As specified in Section 02722.
 4. Native Material:
 - a. Sound, earthen material passing 1 inch sieve.

- b. Percent of material by weight passing Number 200 sieve shall not exceed 30 when tested in accordance with ASTM C 136.
 - c. Expansion index less than 35.
 - d. The use of Bay Mud as a fill material is unacceptable.
5. Pipe Bedding Material:
- a. Class 2 Aggregate base
6. Engineered Fill:
- a. Engineered fill shall meet the following requirements:

Sieve Size	Percent by Weight Passing Sieve
1 inch	100
3/4 inch	80-100
No. 4	20-100
No. 40	10-80
No. 200	10-60

- 1) Plasticity Index (PI) \leq 15 in accordance with ASTM D4318.
 - 2) Liquid Limit (LL) \leq 50 in accordance with ASTM D4318.
 - 3) Expansion Index (UBC 18-2): Less than 50.
 - 4) Minimum pH range $>$ 6.
 - 5) Saturated resistivity $>$ 2,500 ohm-cm.
 - 6) Total water soluble chloride concentration $<$ 300 mg/kg.
 - 7) Total water soluble sulfate concentration $<$ 1,000 mg/kg.
- b. All engineered fill shall have a soil moisture content of 2 percent over optimum moisture content as determined by ASTM Test Method D1557.
- C. Geotextile:
- 1. As specified per Section 02622.
- D. Filter Fabric:
- 1. As specified per Section 02622.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions:
- 1. Character and Quantity of Material:

- a. Verify character and quantity of rock, gravel, sand, silt, water, and other inorganic or organic materials to be encountered in work to be performed.
- b. Determine gradation and shrinkage of excavation and fill material, and suitability of material for use intended in work to be performed.
- c. Determine quantity of material, and cost thereof, required for construction of excavations and fills, whether from on-site excavations, borrow areas, or imported materials. Include in cost of work to be performed.
- d. Include wasting of excess material, if required, in cost of work to be performed.
- e. All excavated soils will need to be segregated, cleaned, and/or screened prior to re-use as embankment fill (engineered fill). Fills used for embankments shall be composed of clean soils free of oversize material, construction debris, organics and contamination and shall meet the specified gradation and quality requirements for engineered fill.

3.02 PREPARATION

A. Surface Preparation:

1. Preparing Ground Surfaces for Fill or Concrete:
 - a. After clearing, grubbing and stripping is completed, scarify entire areas which underlie fill sections or structures to a depth of 6 inches and until surface is free of ruts, hummocks, and other features which would prevent uniform compaction by equipment to be used.
 - b. Moisture condition and recompact areas to density specified in "Compacted Fills" before placing of fill material or concrete.
 - c. Where cemented rock, cobbles, or boulders compose a large portion of foundation material underlying structures, slabs, or paved areas, it may not be advisable to scarify the top 6 inches prior to compaction. If the ENGINEER deems it advisable not to scarify existing natural ground, then moisten the native soil and compact it as specified in "Compaction of Coarse Fill."
 - d. Where subgrade stabilization is required, scarification and compaction of native soils is not practical. In these instances stabilize the subgrade by placing geotextile and crushed rock as shown on the plans and/or specified herein.
 - e. Finished compacted subgrade shall be firm and non-yielding under the weight of compaction equipment. If the relative compaction of the subgrade is less than specified, or the surface of the subgrade exhibits significant yielding, over-excavate the area and rebuild or rework the area until the subgrade compaction conforms to this specification.
2. Preparing for Structural Backfill:

- a. After completion of foundation footings and walls and other construction below the elevation of the final grades and prior to backfilling, all forms shall be removed and excavation shall be cleaned of all trash and debris.
- b. After inspection of foundation, walls, and pipes, backfill shall be placed symmetrically to prevent eccentric loading upon or against structures.
- c. To prevent damage to structures, structural backfill shall be placed with equipment which does not exceed H-20 loading, within a distance of $1/2$ to $1/3$ h (h being the vertical distance from the level being compacted down to the surface on the opposite side of the wall). Outside this distance, normal compaction equipment may be used.
- d. All backfill shall be compacted per Compaction of this specification.

3.03 APPLICATION

A. General:

1. Dispose of excavated materials which are not required or unsuitable for fill and backfill in lawful manner.
2. Dispose of surplus material on private property only when written permission agreement is furnished by owner of property. Submit copies of such agreements.
3. Obtain material required for fills in excess of that produced by excavation from borrow areas subject to the fill material requirements specified herein.
4. Rocks, broken concrete, or other solid materials larger than 4 inches in greatest dimension shall not be placed in fill areas, but removed from project site at no additional cost to the Contract.
5. Stabilization of Subgrade: Provide materials used or perform work to stabilize subgrade so it can withstand loads which may be placed upon it by CONTRACTOR's equipment.
6. The upper 24 inches of the subgrade in pavement areas shall be compacted to 95 percent relative compaction.
7. No material larger than 1" shall be placed in the first two feet below subgrade.

B. Excavation:

1. Excavations for Buildings and Structures:
 - a. All excavations shall comply with Section 02260, Excavation Support and Protection.
 - b. Dimensions and Elevations of Excavations: Provide excavations conforming to dimensions and elevations indicated on the Drawings for each building and structure, including trenching for adjacent piping and all work incidental thereto.

- c. Soil of Unsuitable Bearing Value: Where soil is encountered having unsuitable bearing value, ENGINEER may direct in writing that excavation be carried to elevations above or below those indicated on the Drawings.
 - d. Unless directed by the ENGINEER, excavations shall not be carried below elevations indicated on the Drawings.
 - e. Where excavations are made below elevations indicated on the Drawings, adjust elevations of excavations in accordance with requirements following:
 - 1) Under Slabs: Restore to proper elevation in accordance with procedure specified for backfill in this Section.
 - 2) Under Footings: Restore to proper elevation in accordance with procedure specified for backfill in this Section.
 - f. Excavation Width: Extend excavations at least 24 inches clear from walls and footings to allow for placing and removal of forms, installation of services, and inspection. Undercutting of slopes will not be permitted.
 - g. Bottom of Excavations for Structures: Consist of native material with top 6 inches compacted to 95 percent of maximum density and graded to conform to outside limits of structures as indicated on the Drawings, except where otherwise indicated on the Drawings or specified.
 - h. Difficulty of Excavation: No extra compensation will be made for removal of rock or any other material due to difficulty of excavation.
 - i. Location of Structures on Different Substrates: Where structure will be located partially on fill and partially on undisturbed or natural material, over-excavate entire area to depth of 6 inches below elevations indicated on the Drawings and recompact to 95 percent maximum density.
2. Necessary Over Excavation:
- a. General:
 - 1) Where it becomes necessary to excavate beyond normal lines of excavation in order to remove boulders or other interfering objects, backfill voids remaining after removal as specified in Backfilling of Voids, or as acceptable to the ENGINEER.
 - 2) Perform necessary excavation beyond normal lines as specified above and backfill such voids.
 - b. Backfilling of Voids:
 - 1) Fill voids with suitable material acceptable to the ENGINEER, placed in manner and to same uniform density as surrounding material.
 - 2) With acceptance of the ENGINEER, concrete of same mix as used in concrete channel may be used.
- C. Compaction:
- 1. Compacted Fills:
 - a. Lines and Grades:

- 1) Construct fills, embankments, and backfills, designated herein as fills, at locations and to lines and grades indicated on the Drawings.
2. Where required, CONTRACTOR shall provide necessary imported fill material from outside sources.
 - a. Compacted Fill Shape and Sections: Provide completed fill that corresponds to shape of typical sections indicated on the Drawings or that meets requirements for particular case.
 - b. Preparation of Areas Designated to Receive Fill Material: Scarify to minimum depth of 6 inches, unless otherwise indicated on the Drawings, and recompact to density of fill material as specified in following Article.
 - c. Fills and Backfills and Upper 6 Inches in Cuts: Compact to percentage of maximum density as follows and as determined by ASTM D1557:
 - 1) Backfill adjacent to structures: 95 percent.
 - 2) Under present and future structures: 95 percent.
 - 3) Under roadways and parking areas subject to traffic loading: 95 percent to three feet under subgrade.
 - 4) Under paved areas not subject to traffic loading, curbs, and sidewalks: 90 percent.
 - 5) Other areas: 85 percent.
 - 6) Compacted embankments: 90 percent.
 - 7) Demolition areas: 95 percent.
 - d. Placing Compacted Fills:
 - 1) Placement: Place loose material in successive layers that do not exceed 8 inches in thickness after compaction.
 - 2) Moisture Content: Bring each layer to specified moisture content for maximum density before compaction by rolling.
 - 3) Each successive lift shall be firm and non-yielding under the weight of construction equipment.
 - 4) Defective Compacted Fills: Remove and recompact.

3.04 FIELD QUALITY CONTROL

A. Tests:

1. Confirmation Tests:
 - a. CONTRACTOR shall accomplish specified compaction for backfill, fill, and other earthwork.
 - b. CONTRACTOR may, at his option, arrange for conformation testing through his own forces or a testing laboratory.
 - c. Confirmation testing is only for the Contractor's benefit and shall not substitute for Compliance Tests as specified herein.
 - d. Control operations in response to confirmation tests and CITY Compliance Testing to verify that compaction work complies, and is complying at all times, with requirements specified in this Section concerning compaction, control, and testing.

- e. Cost of Confirmation Tests: Paid for by the CONTRACTOR.
 - f. Confirmation Test submittals are not required.
2. Compliance Tests:
- a. Compliance tests will be made by the CITY to verify that compaction is meeting requirements specified herein.
 - b. CITY's Testing Laboratory will perform confirmation testing as acceptable to the ENGINEER.
 - c. CONTRACTOR shall coordinate with ENGINEER regarding the frequency of Compliance Testing and testing results.
 - 1) Compliance Testing will be performed not less than as follows:
 - a) For embankment and structure backfill, no less than 1 test for every 2 feet of vertical fill thickness and no less than 1 test for every 20 cubic yards of fill placed for structure backfill.
 - b) For base material, no less than 1 test for every 100 cubic yards of base placed.
 - 2) Copies of Compliance Test Reports will be submitted promptly to the ENGINEER for disbursement to CONTRACTOR.
 - d. Coordination with ENGINEER Testing: Remove overburden above level at which the ENGINEER wishes to test and backfill and recompact excavation after testing is completed.
 - e. If compaction fails to meet specified requirements, perform remedial work by one of the following methods:
 - 1) Remove and replace backfill at proper density.
 - 2) Bring density up to specified level by other means acceptable to the ENGINEER.
 - f. Retesting:
 - 1) Costs of Retesting: Costs of retesting required to confirm and verify that remedial work has brought compaction within specified requirements shall be borne by the CONTRACTOR.
 - 2) CITY's Compliance Tests During Performance of Remedial Work will be performed as follows:
 - a) Tests will be performed in a manner acceptable to the ENGINEER.
 - b) Frequency: Double amount specified for initial confirmation tests.
- B. Tolerances:
- 1. Finish Grading of Excavations, Backfill and Fills:
 - a. Perform fine grading under concrete structures such that finished surfaces are never above established grade or approved cross section and are never more than 0.10 feet below.
 - b. Provide finish surface areas outside of structures that are not more than 0.10 feet above or below established grade or accepted cross section.

2. Of Areas Which Are Not under Structures, Concrete, Asphalt, Roads, Pavements, Walks, Dikes and Similar Type Items:
 - a. Provide finish graded surfaces of either undisturbed natural soil, or cohesive material not less than 6 inches deep.
 - b. Intent of preceding is to avoid sandy or gravelly areas.
3. Finished Grading Surfaces:
 - a. Reasonably smooth, compacted, and free from irregular surface changes.
 - b. Provide degree of finish that is ordinarily obtainable from blade grader operations, except as otherwise specified.
 - c. Uniformly grade areas which are not under concrete.
 - d. Finish gutters and ditches so that they drain readily.

3.05 WET WEATHER AND WET SOIL CONDITIONS

- A. To the maximum extent possible within schedule constraints, major excavation should take place during periods of suitable weather conditions.
- B. When the moisture content of fill materials is significantly above optimum:
 1. Scarify and air dry until fill materials have a suitable moisture content for compaction; or
 2. Over-excavate the fill and replace with suitable on-site or import materials with an appropriate moisture content; or
 3. Install a geotextile or geogrid to reinforce soft fill; and/or
 4. Chemically treat with lime, kiln-dust, or cement to reduce the moisture content and increase the strength of the fill.

3.06 ADJUSTING

- A. Finish Grades of Excavations, Backfilling and Fill:
 1. Repair and reestablish grades to required elevations and slopes due to any settlement or washing way that may occur from action of the elements or any other cause prior to final acceptance.

3.07 PROTECTION

- A. Finish Grades of Excavations, Backfilling and Fill:
 1. Protect newly graded areas from action of the elements.
- B. Ditches and Gutters:
 1. Maintain ditches and gutters excavated free from detrimental quantities of debris that might inhibit drainage until final acceptance.

END OF SECTION

**SECTION 02318
TRENCHING****PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Trench excavation, fine grading, pipe bedding, backfilling, and compaction for the following:
 - 1. Gravity sewer pipe.
 - 2. Pressure force main.
 - 3. Electrical conduits.
 - 4. Manholes, valves, or other accessories.
 - 5. Potable water pipe appurtenances.

- B. Related Sections:
 - 1. Section 02260 - Excavation Support and Protection.
 - 2. Section 02300 - Earthwork.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. C 131 - Test Method for Resistance to Degradation of Small-Size Course Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - 2. C 136 - Test Method for Sieve Analysis of Fine and Course Aggregates.
 - 3. D 1556 - Test Method for Density and Unit Weight of Soil in Place by the Sand Cone Method.
 - 4. D 1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft.lbf/ft³ (2,700 kN.m/m³)).
 - 5. D 2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - 6. D 4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

- B. City of Morgan Hill Standard Details
 - 1. Detail U-4 – Trench Restoration/Backfill for Pipe Sizes Greater Than 6”

1.03 SUBMITTALS

- A. Products Data: For all proposed bedding and backfill materials.
 - 1. Material source.
 - 2. Gradation.
 - 3. Testing data and testing laboratory qualifications including lab certification.

- B. Trench excavation plan, drawings, and calculations as specified in Section 02260.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General:
 - 1. Provide material having maximum particle size not exceeding 4 inches and that is free of leaves, grass, roots, stumps, and other vegetable matter.
 - 2. Materials derived from processing demolished or removed asphalt concrete are not acceptable.
- B. Crushed Rock: As specified in Section 02300.
- C. Geotextile Filter Fabric: As specified in Section 02622.
- D. Bedding: Class 2 Aggregate Base as specified in Section 02300.
- E. Backfill: Structural backfill as specified in Section 02300.

PART 3 EXECUTION

3.01 PREPARATION

- A. General:
 - 1. Trench Condition:
 - a. Install pipe and materials as specified herein and detailed on the Drawings.
 - b. Where these specifications conflict the City Standards, City Standards shall govern.
 - 2. Embankment Condition:
 - a. Exists where width of pipe trench exceeds limits specified herein.
 - b. Before laying pipes or electrical conduits in fill, place fill and compact it to not less than 2 feet above top of pipe or conduit.
 - c. After placing and compacting fill, excavate through fill and fine grade as required in this Section.
- B. Protection: Stabilize excavation as specified in Section 02260.

3.02 INSTALLATION

- A. Trench Excavation:
 - 1. General Requirements:

- a. If because of soil conditions, safety requirements or other reasons, trench width at top of pipe is increased beyond width specified in this Section, upgrade laying conditions or install stronger pipe designed in conformance with Specifications for increased trench width, without additional cost.
- b. Pipe and Electrical Conduits:
 - 1) Lay pipe and electrical conduits in open trench.
 - 2) If bottom of excavation is found to consist of rock or any material that by reason of its hardness cannot be excavated to provide uniform bearing surface, remove such rock or other material to a depth of not less than 4 inches below bottom of pipe and refill to grade with bedding material placed at uniform density, with minimum possible compaction, at no additional cost.
 - 3) If bottom of excavation is found to consist of soft or unstable material which is incapable of properly supporting pipe, remove such material to a depth and for the length required, as determined by the ENGINEER, and then refill trench to grade with foundation material as specified compacted to 90 percent maximum density.
- c. Trench Widths:
 - 1) Minimum Clear Width of Trench for Pipes shown on drawings (Measured at Top of Pipe):
 - a) For pipe sizes 4 inches to and including 24 inches in diameter: Not less than outside diameter of pipe plus 24 inches.
 - b) For pipe sizes larger than 24 inches in diameter: Not less than outside diameter of pipe plus 24 inches.
 - 2) Maximum Clear Width of Trench for Pipe (Measured at Top of Pipe):
 - a) For pipe sizes 4 inches to and including 24 inches in diameter: Not to exceed outside diameter of pipe plus 30 inches.
 - b) For pipe sizes larger than 24 inches in diameter: Not to exceed outside diameter of pipe plus 36 inches.
- d. For Manholes, Valves, or Other Accessories:
 - 1) Provide excavations sufficient to leave at least 12 inches clear between their outer surfaces and embankment or shoring which may be used to hold banks and protect them.
 - 2) Do not backfill with earth under manholes, vaults, tanks, or valves.
 - 3) Fill any unauthorized excess excavation below elevation indicated on the Drawings for foundation of any structure with foundation material at no additional cost. Backfill material may be substituted for foundation material in areas where foundation material is not required and when approved by the ENGINEER.
 - 4) Backfilling of Manhole Excavation: Conform to backfilling requirements as specified for trenches in this Section.

B. Pipe Foundation:

1. Over excavate bottom of trench to allow installation of geotextile filter fabric, pipe foundation material, and trench fine grading material as specified. Fill over-cut with foundation material as specified.
 2. Foundation Material:
 - a. Foundation material shall be as scheduled herein unless otherwise specified and shall be provided at all locations where Bay Mud is encountered or where other unstable soils are present at the bottom of the excavation.
 - b. Minimum thickness shall be 24 inches unless otherwise indicated on the Drawings.
 - c. Pipe foundation material shall be compacted to 90 percent maximum density at optimum moisture content or above according to ASTM D1557 before placing filter fabric on top of foundation material.
- C. Pipe Bedding:
1. Bedding material shall be as scheduled herein unless otherwise specified.
 2. General:
 - a. Over excavate bottom of trench to allow installation of at least 6 inches, or 1/12 outside diameter of pipe, whichever is greater.
 - b. Place bedding material at uniform density, with minimum possible compaction.
 3. Bell or Coupling Holes:
 - a. Dig holes after trench fine grading has been placed.
 - b. Provide holes of sufficient width to provide ample room for grouting, banding, or welding.
 - c. Excavate holes only as necessary in making joints and to ensure that pipe rests upon prepared trench bottom and not supported by any portion of the joint.
 4. Depressions for Joints, Other than Bell-and-spigot:
 - a. Make in accordance with recommendations of joint manufacturer for particular joint used.
- D. Pipe Bedding:
1. Bedding material shall be as scheduled herein unless otherwise specified.
 2. After Pipe Laid:
 - a. Place bedding material under, around, and above pipe to 12 inches above top of pipe in maximum 6-inch lifts and compact to 90 percent of maximum density.
 3. Pipe Displacement:
 - a. Take necessary precautions in placement and compaction of bedding material to prevent displacement of piping.

- b. In event there is movement or floating, re-excavate, re-lay, and backfill the pipe.
4. Consolidation:
- a. Bedding shall be mechanically compacted at optimum moisture content or above according to ASTM D1557 with vibratory or other compaction equipment. Water settling methods such as flooding and poling or jetting are prohibited.
- E. Trench Backfill:
- 1. Backfill material shall be as scheduled herein unless otherwise specified.
 - 2. Place and compact backfill in accordance with following requirements:
 - a. From 12 inches above top of pipe to natural surface level. Match finish grade as indicated on the Drawings.
 - b. Backfill for Trench Cuts across Roadways and Paved Streets: Backfill trench to underside of specified pavement section with backfill material compacted to 90 percent of maximum density. Final backfill material for roadways and paved street sections to be compacted to 95 Percent of maximum density.
 - c. Trench Backfill for Longitudinal Trench Cuts in Roadways, Paved Areas, and Storage Areas. Backfill trench to underside of specified pavement replacement section with backfill material compacted to 90 percent of maximum density.
 - d. Trench Backfill for Trench Cuts in Areas outside the Improved Section of Roadways and in Open Country: Backfill trench from 12 inches above top of pipe to finish grade with backfill material compacted to 90 percent of maximum density.
 - e. Trench Backfill through Earth Slopes or Embankments Supporting Structures, Through Structural Fill, or Adjacent to and/or Under Structures: Backfill trench from 12 inches above top of pipe to finish grade with backfill material compacted to 95 percent of maximum density.
 - f. Existing Conditions: Where existing underground pipes or conduits larger than 3 inches in diameter cross trenches above new work:
 - 1) Backfill from bottom of intersecting trench to spring line of intersecting pipe or conduit with backfill material compacted to 90 percent of maximum density when tested in accordance with ASTM D 1556 or ASTM D 2922.
 - 2) Extend backfill material 2 feet on either side of intersecting pipe or conduit to ensure that material remains in place while other backfill is placed.
 - g. Backfill shall be mechanically compacted at optimum moisture content or above according to ASTM D1557 with vibratory equipment weighing no more than 12 tons static weight. All backfill shall be placed in maximum 8-inch lifts. Water settling methods such as flooding and poling or jetting are prohibited.

F. Native Material:

1. Native material shall not be used as backfill.

G. Excess Material:

1. Remove excess excavated material and any excavated Bay Mud from the project site and dispose of legally off-site.

3.03 FIELD QUALITY CONTROL

A. Tests:

1. Confirmation Tests:

a. Contractor's Responsibilities:

- 1) Accomplish specified compaction of trench backfill.
- 2) Control operations by confirmation tests to verify and confirm that compaction work complies, and is complying at all times, with requirements specified in this Section concerning compaction, control, and testing.
- 3) Cost of Confirmation Tests: Paid for by the CONTRACTOR.
- 4) Qualifications of Contractor's Testing Laboratory: Provide lab certification.
- 5) Copies of Confirmation Test Reports: Submit promptly to the ENGINEER.

b. Frequency of Confirmation Testing:

- 1) Perform testing not less than as follows:
 - a) For Trenches: At each test location include tests for each type or class of backfill from bedding to finish grade.
 - b) Along Dirt or Gravel Road or off Traveled Right-of-way: Two every 50 linear feet.
 - c) Crossing Paved Roads: Two locations along each crossing.
 - d) Under Pavement Cuts or Within 2 Feet of Pavement Edges: One location every 400 linear feet.

2. Compliance Tests:

- a. Frequency of Testing: Periodic compliance tests will be made by the ENGINEER to verify that compaction is meeting requirements previously specified.
- b. If Compaction Fails to Meet Specified Requirements: Perform remedial work by one of the following methods:
 - 1) Remove and replace backfill at proper density.
 - 2) Bring density up to specified level by other means acceptable to the ENGINEER.
- c. Retesting:
 - 1) Costs of Retesting: Costs of retesting required to confirm and verify that remedial work has brought compaction within specified requirements shall be borne by the CONTRACTOR.
 - 2) Contractor's Confirmation Tests During Performance of Remedial Work:

- a) Performance: Perform tests in manner acceptable to the ENGINEER.
 - b) Frequency: Double amount specified for initial confirmation tests.
3. Water Testing Pipe:
- a. After Bedding the Pipe, CONTRACTOR Has the Following Option To:
 - 1) Water-test pipe.
 - 2) Backfill to surface, at his own risk, before water-testing pipe.
 - b. If pipe does not pass test, uncover pipe, locate leaks, repair and retest, repeating until pipe section under test passes.

3.04 SCHEDULES

A. Selection of Materials:

LIFT STATION J & K	
Foundation	Crushed Rock
Fine Grading	Class 2 Aggregate Base
Bedding	Class 2 Aggregate Base
Back Fill	Structural Backfill

END OF SECTION

**SECTION 02622
FILTER FABRIC AND GEOTEXTILES**

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Engineering Fabrics (Geotextiles).

1.02 REFERENCES

- A. American Society of Testing and Materials (ASTM):
 1. D 3776 - Test Methods for Mass per Unit Area (Weight) of Woven Fabric.
 2. D 4491 - Test Methods for Water Permeability of Geotextiles by Permittivity.
 3. D 4632 - Test Method for Grab Breaking Load and Elongation of Geotextiles.

1.03 DEFINITIONS

- A. Filter Fabric for Drains and Underdrains: Nonwoven filter fabric manufactured from polyester, nylon, or polypropylene material, or any combination thereof.
- B. Geotextile: Woven Polypropylene geotextile fabric
- C. Geogrid: Woven polyester biaxial geogrids for base course reinforcement and subgrade stabilization applications.

1.04 PROJECT CONDITIONS

- A. Take field measurements to determine the exact lengths and dimensions of the surfaces to receive the fabric.

1.05 SUBMITTALS

- A. Product Data.
- B. Samples.
- C. Quality Control:
 1. Certificates of Compliance.
 2. Manufacturer's Instructions.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Quality Control:

1. Furnish engineering fabrics in protective covers capable of protecting the fabric from ultraviolet rays, abrasion, and water.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Filter Fabric for Drains and Underdrains - One of the Following or Equal:
 1. Nicolon, Mirafi 140NC.
 2. Amoco, Style 4550.
- B. Geotextile for separation and stabilization over very weak subgrades - One of the Following or Equal:
 1. Mirafi, 600X Geofabric.
 2. Amoco, Style 2006.
- C. Geotextile for base course reinforcement and stabilization under asphaltic concrete or permeable pavement - One of the Following or Equal:
 1. Mirafi, BasXgrid 12 Geogrid.
 2. Tensar Earth Technologies, BX1200 (Biaxial) Geogrid.
- D. Geotextile for base course reinforcement and stabilization under asphaltic concrete or permeable pavement - One of the Following or Equal:

PART 3 EXECUTION

3.01 PREPARATION

- A. Surface Preparation: During grading operations, take care not to disturb or scarify the subgrade. This may require use of lightweight dozers for low strength soils such as saturated, cohesionless, or low cohesion soils. Recompact to minimum 95 percent at maximum density if subgrade is scarified.
- B. Prior to placement of fabric; prepare surface to smooth conditions free of debris, depressions, or obstructions which may damage the fabric.

3.02 INSTALLATION

- A. Follow manufacturer's installation instructions and as complimented herein.
- B. Place the fabric smoothly without folds or wrinkles.
- C. Use special care when placing the fabric in contact with the soil so that no void spaces occur between the geotextile and the prepared surface.
- D. Overlap the fabric sheets as indicated on the Drawings or according to manufacturer's installation, whichever is greater.

- E. Place drainage aggregate on the geotextile as specified.

3.03 FIELD QUALITY CONTROL

- A. Inspection: Before covering, the conditions of the fabric will be observed by the ENGINEER to determine that no holes or rips exist in the fabric. Repair all such occurrences by placing a new layer of fabric extending beyond the defect in all directions a distance equal to the minimum overlap required for adjacent rolls.

END OF SECTION

**SECTION 02722
AGGREGATE BASE COURSE**

PART 1 GENERAL**1.01 SUMMARY**

- A. Section Includes: Aggregate base course.
- B. Related Sections:
 - 1. Section 02300 - Earthwork.
 - 2. Section 02742 - Asphaltic Concrete Paving.
 - 3. Section 02990 - Pavement Restoration.

1.02 REFERENCES

- A. American Society of Testing and Materials (ASTM):
 - 1. C 117 - Test Method for Material Finer than 75 Φ M (Number 200) Sieve in Mineral Aggregate by Washing.
 - 2. C 136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
 - 3. D 4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- B. State of California Department of Transportation.
 - 1. CALTRANS - Standard Specifications.

1.03 SUBMITTALS

- A. Product Data:
 - 1. Source, gradation, and testing data for aggregate base course.
- B. Quality Control:
 - 1. Test Reports: Reports for tests required by Sections of CALTRANS Standard Specifications.
 - 2. Certificates of Compliance: Certificates as required by Sections of CALTRANS Standard Specifications.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Storage and Protection: Protect from segregation and excessive moisture during delivery, storage, and handling.

PART 2 PRODUCTS

2.01 MATERIALS

A. Aggregate Base Course:

1. Class 2, 3/4-inch maximum aggregate size free from vegetable matter and other deleterious substances, and of such nature that aggregate can be compacted readily under watering and rolling to form a firm, stable base.
2. Materials derived from processing demolished or removed asphalt concrete are not acceptable.
3. Coarse aggregate material retained in Number 4 sieve shall consist of material of which at least 25 percent by weight shall be crushed particles when tested in accordance with California Test 205.
4. Aggregate shall not be treated with lime, cement, or other chemical material before the Durability Index test is performed.
5. Aggregate grading and sand equivalent tests shall be performed to represent not more than 500 cubic yards or one day's production of material, whichever is smaller.
6. Grade within the limits and conform to quality requirements as follows when tested in accordance with California Test 202:

Sieve Sizes (Square Openings)	Percent by Weight Passing Sieve
1 inch	100
3/4 inch	90-100
Number 4	35-55
Number 30	10-30
Number 200	2-9

Quality Requirements		
Description	California Test	Minimum Test Result
Resistance (R Value)	301	78
Sand Equivalent	217	22
Durability Index	229	35

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verification of Conditions: Examine conditions upon which the work specified in this Section depends for defects that may influence installation and performance.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Subgrade Preparation: Prepare as specified in Section 02300, "Earthwork."

3.03 INSTALLATION

- A. Furnish, spread, and compact aggregate base course material to the lines, grades, and dimensions indicated on the Drawings.
 - 1. Spreading: Spread in accordance with sections of CALTRANS Standard Specifications.
 - 2. Compacting: Compact in accordance with sections of CALTRANS Standard Specifications.

3.04 FIELD QUALITY CONTROL

- A. Tests: Perform field tests as required by sections of CALTRANS Standard Specifications.

END OF SECTION

**SECTION 02742
ASPHALTIC CONCRETE PAVING**

PART 1 GENERAL**1.01 SUMMARY**

- A. Section Includes: Asphaltic concrete pavement including open graded pavement on prepared subgrade or aggregate base course or on existing pavement to lines, grades and compacted thickness as indicated on the Drawings.
- B. Related Sections:
 - 1. Section 02300 - Earthwork.
 - 2. Section 02722 - Aggregate Base Course.
 - 3. Section 02990 - Pavement Restoration and Rehabilitation.

1.02 REFERENCES

- A. State of California Department of Transportation Standard Specifications, latest edition (CALTRANS Standard Specifications).
 - 1. Section 37 - Bituminous Seals.
 - 2. Section 39 - Asphalt Concrete.
 - 3. Section 92 - Asphalts.
 - 4. Section 93 - Liquid Asphalts.
 - 5. Section 94 - Asphaltic Emulsions.
- B. CALTRANS Standard Test Methods:
 - 1. Calif Test 202 - Sieve Analysis of Fine and Coarse Aggregates.
 - 2. Calif Test 304 - Preparation of Bituminous Mixtures for Testing.
 - 3. Calif Test 362 - Determining Asphalt Content in Bituminous Mixtures by Vacuum Extraction.
 - 4. Calif Test 375 - Determining the In-Place Density and Relative Compaction of AC Pavement.
 - 5. Calif Test 379 - Determining Asphalt Content in Bituminous Mixtures (Troxler Nuclear Gage Model 3241).
- C. American Society for Testing and Materials (ASTM) Standards:
 - 1. ASTM D1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.
 - 2. ASTM D1561 - Practice for Preparation of Bituminous Mixture Test Specimens by Means of California Kneading Compactor.

1.03 SYSTEM DESCRIPTION

- A. This Work shall consist of furnishing and mixing aggregate and asphalt binder at a central mixing plant, spreading and compaction of the mixtures as specified and as indicated on the Drawings.

- B. In general, asphalt concrete and asphalt concrete base shall conform to Section 39 "Asphalt Concrete" and all applicable referenced sections of the CALTRANS Standard Specifications.

- 1. Where conflicts exist, this specification shall govern.

1.04 DEFINITIONS

- A. "Asphalt Concrete" as used by CALTRANS shall be considered the "Surface Course," or the final lift of the pavement section.
- B. "Asphalt Concrete Base" as used by CALTRANS shall be the remaining portion of the asphalt pavement section excluding the final lift.
- C. "Asphalt Pavement" shall be the total pavement section of asphalt including Asphalt Concrete and Asphalt Concrete Base.

1.05 SUBMITTALS

- A. Proposed Mix Design and Gradation of Materials.
- B. Shop Drawings.
- C. Product data:
 - 1. Asphalt.
 - 2. Asphalt aggregate
 - 3. Pavement reinforcing fabric.
- D. Quality Control Submittals:
 - 1. Test Results.
 - 2. Certificate of Compliance.
 - 3. Certificate of Competence.
- E. Equipment List.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Asphalt Pavement Delivery:
 - 1. Transport the mixture from the mixing plant to the point of use in vehicles having tight bodies previously cleaned of all foreign materials.
 - 2. Treat bodies as necessary to prevent material from sticking to the bodies.
 - 3. Cover each load with canvas or other suitable material of sufficient size and thickness to protect the asphalt mixture from the weather.

1.07 PROJECT CONDITIONS

- A. Environmental Requirements:

1. Asphalt Concrete:
 - a. Place asphalt concrete only when surface is dry, when atmospheric temperature in the shade is 40 degrees F and rising, or above 50 degrees F if falling.
 - b. Do not place asphalt concrete when weather is foggy or rainy nor when base on which material is to be placed is in wet or frozen conditions or when, in the opinion of the ENGINEER, weather conditions will prevent proper handling, finishing, compaction of the mixtures.
2. Prime Coat:
 - a. Do not apply prime coat when atmospheric temperature is below 60 degrees F.
 - b. Apply prime coat only when base course is dry or contains moisture not in excess of that which will permit uniform distribution and desired penetration.

PART 2 PRODUCTS

2.01 ASPHALT PAVEMENT MATERIALS

- A. Asphalts:
 1. Asphalt Binder: Steam-refined paving asphalt, Grade AR-4000, conforming to Section 92-1.02 "Grades" of the CALTRANS Standard Specifications.
 2. Prime Coat and Tack Coat: Grade SC-70, conforming to Section 93-1.01 of the CALTRANS Standard Specifications.
 3. Fog Seal: Asphaltic Emulsion, Grade SS-1h, conforming to Section 94-1.01 of the CALTRANS Standard Specifications.
- B. Asphalt Aggregate:
 1. Aggregate for asphalt concrete shall conform to Section 39-2.02 of the CALTRANS Standard Specifications for Type B grading, 1/2-inch maximum, medium.
 2. Aggregate for asphalt concrete base shall conform to Section 39-2.02 of the CALTRANS Standard Specifications for Type B grading.
- C. Asphalt pavement shall be produced in a batch mixing plant, a continuous pugmill mixing plant, or drier-drum mixing plant.
 1. Storage shall conform to section 39-3.01 and Section 39-3.05 of the CALTRANS Standard Specifications.
 2. Drying shall conform to Section 39-3.02 of the CALTRANS Standard Specifications.
 3. Proportioning shall conform to Section 39-3.03 of the CALTRANS Standard Specifications.

4. Mixing shall conform to Section 39-3.04 of the CALTRANS Standard Specifications.

2.02 HOT-MIX ASPHALT PAVEMENT

- A. Open graded asphalt shall be used as indicated on the Drawings.
- B. Bituminous Asphalt Cement.
 1. 5.75% to 6% by weight dry aggregate.
 2. Drain down of asphalt binder shall be no greater than 0.3% in accordance with ASTM D6390.
 3. Use a neat asphalt binder meeting the requirements of PG 64-10.
 4. Add hydrated lime at a rate of 1% by weight of the total dry aggregate to mixes with granite stone to prevent separation of the asphalt from the aggregate.
 - a. Tensile strength ratio shall be at least 80%.
 - b. Hydrated lime shall meet the requirements of ASTM C977.
 5. Test asphalt mix for resistance to stripping by water per ASTM D3625. Add anti-stripping agents to asphalt if the estimated coating area is not above 95%.
- C. Asphalt Aggregate:

U.S. Standard Sieve	Percent Passing
1/2	100
3/8	92-98
4	32-38
8	12-18
16	7-13
30	0-5
200	0-3

- D. Aggregate Base
 1. Coarse aggregate shall be 1/2- to 2-inch uniformly graded stone with a wash loss of no more than 0.5% (AASHTO size number 3).
 2. Aggregate Grading:

U.S. Standard Sieve	Percent Passing
2 1/2"	100
2"	90-100
1 1/2"	35-70
1"	0-15
1/2"	0-5

2.03 SLURRY SEAL

- A. Slurry seal, Type II, shall be applied in conformance with the provisions in Section 37-2, and all applicable referenced sections of the CALTRANS Standard Specifications, at the following locations:
 - 1. In all streets and private property easement in which excavation is performed by the CONTRACTOR, slurry seal shall be applied from gutter lip to gutter lip. The slurry seal shall extend 5 feet beyond any excavation in the direction parallel to the gutters.

2.04 AGGREGATE BASE COURSE

- A. Aggregate Base Course shall conform with Section 02722 "Aggregate Base Course".
- B. Aggregate Base Course shall be placed at the following locations:
 - 1. All asphalt pavement.
- C. Compacted thickness of Aggregate Base Course shall be as indicated on the Drawings.

2.05 EQUIPMENT

- A. Spreading and Compacting Equipment:
 - 1. Spreading equipment shall conform to Section 39-5.01 and all applicable referenced sections, of the CALTRANS Standard Specifications.
 - a. Only in areas inaccessible to the machine, by approval of the ENGINEER, will hand spreading be permitted.
 - 2. Compaction equipment shall conform to Section 39-5.02 and all applicable referenced sections, of the CALTRANS Standard Specifications.

2.06 SOURCE QUALITY CONTROL

- A. The ENGINEER will perform sampling and tests of materials in accordance with California Test Method Number 304 and California Test Method Number 362 or 379, as applicable. Samples will be taken from materials as delivered to the site.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verification of Conditions: Verify surfaces and site conditions are ready to receive work. If unsatisfactory conditions exist, do not commence installation until such conditions have been corrected. Beginning application means acceptance of existing conditions.

3.02 PREPARATION**A. Protection:**

1. Protect concrete pavements and walks, curbs and bases, and other improvements adjacent to the operations with suitable materials.
2. Building and other surfaces shall be covered with paper or other protection, when required.
3. CONTRACTOR shall be responsible for any damage caused by CONTRACTOR's employees. All damage caused by the CONTRACTOR's operations shall be repaired to the satisfaction of the ENGINEER at no additional cost to CITY.

B. Subgrade Preparation:

1. Immediately prior to applying prime coat or tack coat, or immediately prior to placing the asphalt pavement when prime coat or tack coat is not required, the subgrade to receive asphalt pavement shall conform to the compaction requirement and elevation tolerances specified for the material involved and shall be cleaned to remove any loose or extraneous material.
2. If the asphalt pavement is to be placed on an existing base or pavement which was not constructed as part of the contract, the CONTRACTOR shall clean the surface by sweeping, flushing or other means to remove all loose particles of paving, all dirt and all other extraneous material immediately before applying the prime coat or tack coat. If the asphalt pavement is to be placed against a vertical gutter face or other vertical surface, the CONTRACTOR shall roughen and clean vertical surface as required for proper bonding of asphalt immediately before applying prime coat or tack coat.

C. Removal and Preparation of Existing Pavement:

1. Cut existing asphalt pavement to be removed with wheel cutter or other device capable of making a neat, reasonably straight and smooth cut without damaging the adjacent pavement to remain.
2. Cut and trim existing pavement after placement of specified base course material and just prior to placement of new asphaltic concrete pavement. Trimmed edges shall be coated with prime or tack coat as specified immediately prior to installing new abutting asphalt pavement.
3. All removed aggregate base material and asphaltic concrete pavement and any excess new material shall be removed from the project site and legally disposed of by the CONTRACTOR.

3.03 PRIME COAT AND TACK COAT**A. Prime Coat:**

1. A prime coat of liquid asphalt shall be applied on all surfaces of base course material to be paved.

2. Prime coat shall be applied at a rate of 0.25 gallons per square yard, and shall conform to Section 93-1.03 of the CALTRANS Standard Specifications for the distributor application of the grade of liquid asphalt being used.

B. Tack Coat:

1. A tack coat of asphaltic emulsion shall be applied to all vertical surfaces of existing pavement, curbs, gutters, and construction joints in the surfacing against which additional material is to be placed, or as otherwise specified herein.
2. Tack coat shall be applied in one application at a rate of 0.1 gallons per square yard of surface covered.

3.04 ASPHALT PAVEMENT

- A. Placing materials in a windrow, then picking it up and placing it in the asphalt paver with loading equipment will not be permitted.
- B. Unless lower temperatures are directed by the ENGINEER, asphalt concrete shall be spread, and the first coverage of initial or breakdown compaction shall be performed when the temperature of the mixture is not less than 250 degrees F, and all breakdown compaction shall be completed before the temperature of the mixture drops below 205 degrees F.
- C. Asphalt pavement shall be spread and compacted in the number of layers and of the thicknesses indicated in the following table:
 1. A thickness tolerance of ± 0.1 inches is allowed for asphalt concrete.
 2. A total thickness tolerance of ± 0.2 inches is allowed for asphalt concrete base.
 3. Permeable pavement shall be 2.5 inches thick.

Total Thickness Indicated on Drawings ⁽¹⁾	Number of Lifts	Top Layer Thickness		Next Lower Layer Thickness		All Other Lower Layer Thicknesses	
		Min	Max	Min	Max	Min	Max
< 2 ³ / ₄ "	1	-----	-----	-----	-----	-----	-----
3"	2	1 ¹ / ₄ "	1 ¹ / ₂ "	1 ¹ / ₄ "	1 ¹ / ₂ "	-----	-----
3 ¹ / ₄ " - 4 ³ / ₄ "	2	1 ³ / ₄ "	2 ¹ / ₄ "	1 ³ / ₄ "	3"	-----	-----
> 5"	(2)	1 ³ / ₄ "	2 ¹ / ₄ "	1 ³ / ₄ "	3"	1 ³ / ₄ "	4 ³ / ₄ "

- (1) When pavement reinforcing fabric is shown to be placed between layers of asphalt pavement, the thickness of asphalt pavement above the pavement reinforcing fabric shall be considered to be the "Total Thickness Indicated on the Drawings" for the purpose of spreading and compacting the asphalt pavement above the pavement reinforcing fabric.
- (2) At least two layers shall be placed if the total thickness is less than 5". At least three layers shall be placed if the total thickness is more than 5", and less than 10½". At least four layers shall be placed if the total thickness is greater than 10½".

- D. A layer shall not be placed over another layer which exceeds 3 inches in compacted thickness until the temperature of the layer which exceeds 3 inches in compacted thickness is less than 160 degrees F at mid depth.
 - 1. If the temperature of any layer drops below 140 degrees F, or if directed by the ENGINEER, apply tack coat before placing next layer.

- E. Unless otherwise indicated on the Drawings, asphalt mixtures shall not be handled, spread or windrowed in a manner that will stain the finished surface of any pavement or other improvements.

- F. The completed mixture shall be deposited on the prepared subgrade at a uniform quantity per linear foot, as necessary to provide the required compacted thickness without resorting to spotting, picking-up or otherwise shifting the mixture.

- G. Spreading:
 - 1. All layers of asphalt pavement shall be spread with an asphalt paver and shall conform to Section 39-6.02 and all applicable referenced sections of the CALTRANS Standard Specifications.
 - 2. At locations where the asphalt pavement is to be placed over areas inaccessible to spreading and rolling equipment, all layers of asphalt pavement shall be distributed directly out of the back of the dump truck and spread by hand.
 - a. Asphalt pavement spread by hand shall be compacted thoroughly to the required lines, grades and cross-sections by means of pneumatic tampers, or by other methods that will produce the same degree of compaction as pneumatic tampers.

- H. Compaction:
 - 1. Compaction of asphalt pavement shall conform to Section 39-6.03 and all applicable referenced sections of the CALTRANS Standard Specifications.
 - 2. Minimum required density for each layer of asphalt pavement shall be 95 percent of that obtained in the laboratory according to ASTM Test Method D-1561.

- I. Segregation shall be avoided and the surfacing shall be free of pockets of coarse or fine material. Asphalt pavement containing hardened lumps shall not be used.

1. In areas inaccessible to paving and compacting equipment where spreading is done by hand, minimize the amount of segregation.
- J. Location of longitudinal joints in the top layer will be determined by the ENGINEER and shall not adversely affect the quality of the finished product.
- K. At all locations, or as directed by the ENGINEER, the asphalt concrete shall be square and at least 1 inch thick when conforming to existing surfacing. Tapering or feathering is not allowed.

3.05 SPECIAL REQUIREMENTS FOR PERMEABLE PAVEMENT

- A. Bituminous surface course mix shall be laid in one 2.5-inch thick lift directly over aggregate base.
- B. Laying temperature of the mix shall be between 240 and 250 degrees F and ambient temperatures shall not be below 40 degrees F during the duration of paving activities.
- C. Compaction of the surface course shall occur when the surface is cool enough to resist a ten ton roller.
 1. No more than two passes shall be made for compaction to preserve surface course porosity.
- D. Install one inch thick choker course evenly over the surface of coarse aggregate base.

3.06 FIELD QUALITY CONTROL

- A. The CONTRACTOR shall control the quality of Work and shall provide adequate testing to assure compliance with these Specifications.
 1. The type and size of the samples shall be suitable to determine conformance with stability, density, thickness and other specified requirements. Use an approved power saw or core drill for cutting samples. Furnish all tools, labor, and materials for cutting samples, testing, and replacing the pavement where samples were removed. Take a minimum of 1 sample for every 4000 square feet of asphalt pavement placed.
- B. All asphalt pavement shall match the grades indicated on the Drawings and shall be completely free from unintended hollows and high spots.
 1. After completion of paving work, all paving shall be flooded with water. Any ponding that results in standing water greater than 3/4 inches in depth shall be ringed with chalk. Such hollows shall be corrected by removing and replacing the asphalt concrete. The asphalt concrete patch shall be square and at least 1 inch thick when conforming to existing surfacing. Tapering or feathering is not allowed.
- C. CONTRACTOR shall perform in-place density and compaction tests of the completed pavement in accordance with California Test Method Number 375, to

determine compliance with the specified requirements. Submit test results to ENGINEER for approval.

- D. Cracks, settling of surface, improper drainage, improper compaction, and sloppy connection to previously laid surfaces will be construed as improper workmanship and will not be accepted.

3.07 MAINTENANCE OF PAVEMENT

- A. Upon completion of final rolling, traffic shall not be permitted on the finished pavement for at least 6 hours, or until the asphalt pavement has cooled sufficiently to withstand traffic without being deformed.

3.08 WORKMANSHIP AND WARRANTY

- A. CONTRACTOR shall provide written warranty against defects in materials or workmanship for a period of not less than 1 year upon completion of Work.

END OF SECTION

**SECTION 02830
MODULAR RETAINING WALL SYSTEM**

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Work includes furnishing and installing modular concrete block retaining wall units to the lines and grades designated on the contract plans and as specified herein.
2. Work includes preparing foundation soil, furnishing and installing wall base, drain rock, filter fabric, and backfill to the lines and grades shown on the contract plans.

B. Related Sections:

1. Section 01330 – Submittal Procedures
2. Section 02260 – Excavation Support and Protection
3. Section 02300 – Earthwork
4. Section 02318 – Trenching
5. Section 02622 – Filter Fabric and Geotextiles

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. C140 – Sample and Testing concrete Masonry Units.
2. C1372 – Standard Specification for Segmental Retaining Wall Units.
3. C1262 – Evaluating the Freeze thaw Durability of Manufactured CMU's and Related concrete Units.
4. D422 – Particle-Size Analysis of Soils.
5. D698 – Moisture Density Relationship for Soils, Standard Method.
6. D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort
7. D4475 - Horizontal Shear Strength of Pultruded Reinforced Plastic Rods
8. D4476 – Flexural Properties of Fiber Reinforced Pultruded Plastic Rods
9. D6916 – Shear Strength Between Segmental Concrete Units

B. American Association of State Highway and Transportation Officials (AASHTO):

1. M 288 – Geotextile Specification for Highway Applications

C. National Concrete Masonry Association (NCMA)

1. SRWU-1 Test Method for Determining Connection Strength of Segmental Retaining Walls (SRW)

2. SRWU-2 Test Method for Determining Shear Strength of Segmental Retaining Walls (SRW)

PART 2 PRODUCTS

2.01 MATERIALS

A. Modular Wall Units:

1. Wall units shall be Keystone Concrete Retaining Wall Units as produced by a licensed manufacturer.
2. Keystone concrete units shall conform to the following architectural requirements:
 - a. Split face and tan in color.
 - b. Straight face configuration.
 - c. Running bond configuration with bonds nominally located at midpoint of vertically adjacent units.
 - d. Exposed surfaces of units shall be free of chips, cracks or other imperfections
3. Concrete materials shall conform to the requirements of ASTM C1372 - Standard Specifications for Segmental Retaining Wall Units.
4. Concrete units shall conform to the following structural and geometric requirements measured in accordance with ASTM C140 Sampling and Testing Concrete Masonry Units:
 - a. Compressive strength: at least 3000 psi (21 MPa);
 - b. Absorption: at least 8 % for standard weight aggregates;
 - c. Dimensional tolerances: $\pm 1/8"$ (3 mm) from nominal unit dimensions not including rough split face;
 - d. Unit size: 8" height x 18" width x 18" depth minimum;
 - e. Unit weight: 93-lbs/unit minimum.
5. Concrete units shall conform to the following performance testing:
 - a. Inter-unit shear strength in accordance with ASTM D6916 (NCMA SRWU-2): 1500-plf (21 kN/m) minimum at 2-psi (13 kPa) normal pressure;
6. Concrete units shall conform to the following constructability requirements:
 - a. Vertical setback: 1" per course.
 - b. Alignment and grid positioning mechanism: fiberglass pins, two per unit.
 - c. Horizontal gap between erected units shall not be greater than 1/2 inch.

B. Shear Pin Connectors

1. Shear and reinforcement pin connectors shall be 1/2-inch diameter thermoset isophthalic polyester resin pultruded fiberglass reinforcement rods to provide connection between vertically adjacent units, with the following requirements:
 - a. Flexural Strength in accordance with ASTM D4476: 128,000 psi minimum
 - b. Short Beam Shear in accordance with ASTM D4475: 6,400 psi minimum.

C. Wall Base Rock

1. Base rock shall be compacted crushed stone base.

D. Drain Wall Rock:

1. Drain rock shall consist of clean 1" minus crushed stone or crushed gravel meeting the following gradation tested in accordance with ASTM D-422:

<u>Sieve Size</u>	<u>Percent Passing</u>
1-inch	100
3/4-inch	75-100
No. 4	0-10
No. 50	0-5

2. Drainage fill shall be placed within the cores of, between, and behind the units as indicated on the contract plans.

E. Geotextile Filter Fabric:

1. When required, geotextile filter fabric shall be a needlepunched, nonwoven fabric that meets the requirements of AASHTO M288 specifications.

PART 3 EXECUTION

3.01 CONSTRUCTION

A. Excavation:

1. Contractor shall excavate to the lines and grades shown on the construction drawings. Contractor shall use caution not to over-excavate beyond the lines shown, or to disturb the base elevations beyond those shown.
2. Contractor shall verify locations of existing structures and utilities prior to excavation. Contractor shall ensure all surrounding structures and utilities are protected from the effects of wall excavation.

B. Foundation Soil Preparation:

1. Foundation soil shall be defined as any soils located beneath a wall.
2. Foundation soil shall be excavated as dimensioned on the plans and

compacted to a minimum of 90% relative compaction (ASTM D1557) prior to placement of the base material.

C. Base:

1. Base rock shall be placed to the lines and grades shown on the construction drawings, to a minimum thickness of 6 inches and extend laterally a minimum of 6" in front and behind the wall units.
2. Compaction shall be to a minimum of 95 % Standard Proctor density per ASTM D-698 or 92% Modified Proctor Density per ASTM D1557.
3. Base shall be prepared to insure full contact to the base surface of the concrete units.

D. Unit Installation:

1. Install units in accordance with the manufacturer's instructions and recommendations for the specific concrete retaining wall unit, and as specified herein.
2. First course of units shall be placed on the base rock pad at the appropriate line and grade. Alignment and level shall be checked in all directions and insure that all units are in full contact with the base and properly seated.
3. Place the front of units side-by-side. Do not leave gaps between adjacent units. Layout of corners shall be in accordance with manufacturer's recommendations.
4. Install shear/connecting devices per manufacturer's recommendations.
5. Place and compact drain rock within and behind wall units, placing filter fabric as shown on the contract plans. Maximum stacked vertical height of wall units, prior to unit drainage fill and backfill placement and compaction, shall not exceed two courses.
6. Cap units shall be glued to underlying units with an all-weather concrete construction adhesive.

END OF SECTION

**SECTION 02990
PAVEMENT RESTORATION AND REHABILITATION**

PART 1 GENERAL**1.01 SUMMARY**

A. Section Includes:

1. Resurfacing roads and paved surfaces in which surface is removed or damaged by installation of new work. Depth of aggregate base course shall match depth of existing aggregate base course or shall be a minimum of 6 inches, whichever is greater, unless otherwise indicated on the Drawings.

B. Related Sections:

1. Section 02722 - Aggregate Base Course.
2. Section 02742 - Asphaltic Concrete Paving.
3. Section 03300 - Cast-in-place Concrete.

1.02 SYSTEM DESCRIPTION

A. Performance Requirements:

1. Limiting Dimensions:
 - a. Determine the exact lengths and dimensions of such roads, pavements, parking areas, and walks that will require removal and replacement for new work.
 - b. Join existing surfaces to terminals of new surfacing in smooth juncture.

1.03 SUBMITTALS

A. Mix Designs:

1. Prior to placement of asphalt concrete, submit full details, including design and calculations for the asphalt concrete mix proposed.
2. Submit gradation of aggregate base.
3. Submit proposed mix design of portland cement concrete.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Aggregate Base Course: As specified in Section 02722.
- B. Asphalt Pavement: As specified in Section 02742.

- C. Portland Cement Concrete Replacement Material: Class A concrete as specified in Section 03300.

2.02 EQUIPMENT

- A. Roads, Pavements, Parking Areas, and Walks:
 - 1. Equipment Requirements: Good condition, capable of performing work intended in satisfactory manner.

2.03 ACCESSORIES

- A. Material for Painting Asphalt Concrete Pavement: Tack coat as specified in Section 02742.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Aggregate Surface Removal Replacement:
 - 1. When trench cut is in aggregate surfaced areas, replace aggregate base course material with material matching existing material compacted to 95 percent of its maximum density. Depth of aggregate base course shall match depth of existing aggregate base course or shall be a minimum of 6 inches, whichever is greater, unless otherwise indicated on the Drawings.
- B. Pavement Removal and Temporary Asphalt Replacement:
 - 1. Install temporary asphalt pavement or first course of permanent pavement replacement immediately following backfilling and compaction of trenches that have been cut through existing pavement.
 - 2. Except as otherwise provided, maintain this temporary pavement in a safe and reasonably smooth condition until required permanent pavement is installed.
 - 3. Remove and dispose of temporary paving from project site.
 - 4. Where longitudinal trench is partly in pavement, replace pavement to original pavement edge, on a straight line, parallel to centerline of roadway.
 - 5. Where no part of longitudinal trench is in pavement, surfacing replacement shall only be required where existing surfacing materials have been removed.
- C. Asphalt Pavement Replacement:
 - 1. Replace asphalt pavement to same thickness as adjacent pavement and match as nearly as possible adjacent pavement in texture, unless otherwise indicated on the Drawings.
 - 2. Cut existing asphalt pavements to be removed for trenches or other underground construction by wheel cutter, clay spade, or other device

capable of making neat, reasonably straight, and smooth cut without damaging adjacent pavement. Cutting device operation shall be subject to acceptance of ENGINEER.

3. Cut and trim existing pavement after placement of required aggregate base course and just prior to placement of asphalt concrete for pavement replacement, and paint trimmed edges with material for painting asphalt concrete pavement immediately prior to constructing new abutting asphalt pavements. No extra payment will be made for these items, and all costs incurred in performing this work shall be incidental to pipe laying or pavement replacement.
4. Conform replacement of asphalt pavement to contour of original pavement.

D. Portland Cement Concrete Pavement Replacement:

1. Where trenches lie within Portland cement concrete section of streets, alleys, sidewalks, and similar concrete construction, saw cut such concrete (to a depth of not less than 1-1/2 inches) to neat, vertical, true lines in such manner adjoining surfaces are not damaged.
2. Place portland cement concrete replacement material to dimension as indicated on the Drawings.
3. Provide expansion joints that match existing.
4. Before placing replacement concrete, thoroughly clean edges of existing pavement and wash with neat cement and water.
5. Surface Finish: Wood float finish.

E. Curb, Gutter, and Sidewalk Replacement:

1. Where any concrete curb, gutter, or sidewalk has been removed or displaced, replace to nearest construction joints with new Class A curb, gutter, or sidewalk to same dimensions and finish as original construction that was removed.
 - a. Provide expansion joints of same spacing and thickness as original construction.

F. Pavement Matching:

1. Trim existing asphalt pavements which are to be matched by pavement widening or pavement extension to neat true line with straight vertical edges free from irregularities with saw specifically designed for this purpose. Minimum allowable depth of cut shall be 1-1/2 inches.
2. Cut and trim existing pavement after placement of required aggregate base course and just prior to placement of asphalt concrete for pavement widening or extension, and paint trimmed edges with material for painting asphalt concrete pavement immediately prior to constructing new abutting asphalt concrete pavements. No extra payment will be made for these items and all costs incurred in performing this work shall be incidental to widening or pavement extension.

3.02 FIELD QUALITY CONTROL

A. Tests:

1. Asphalt concrete as specified in Section 02742.
2. Concrete as specified in Section 03300.

B. Inspection:

1. Asphalt Concrete:
 - a. Lay 10-foot straightedge parallel to centerline of trench when the trenches run parallel to street and across pavement replacement when trench crosses street at angle.
 - b. Remove and correct any deviation in cut pavement replacement greater than 1/4 inch in 10 feet.
2. Portland Cement Concrete Replacement Pavement:
 - a. Lay 10 foot straightedge either across pavement replacement or longitudinal with centerline of gutter or ditch.
 - b. Remove and correct any deviation in cut pavement replacement greater than 1/4 inch in 10 feet.

END OF SECTION

**SECTION 03200
CONCRETE REINFORCEMENT**

PART 1 GENERAL**1.01 SUMMARY**

- A. The work included under this section consists of furnishing all material, supplies, equipment, tools, transportation, and facilities, and performing all labor and services necessary for, required in connection with or properly incidental to furnishing and installing all reinforcing bars, ties, spacing devices, inserts, and all other material required to complete installation, as described in this section of the specifications, shown on the accompanying drawings, or reasonably implied therefrom.
- B. Work Included:
 - 1. Fabricating and installing all reinforcing steel for cast in place concrete
 - 2. Fabrication of reinforcing steel dowels to be embedded in existing concrete.
- C. Related Work Specified Elsewhere:
 - 1. Cast-in-Place Concrete; Section 03300

1.02 REFERENCES

- A. The following is a list of Reference Standards referred to in this portion of the specifications:
 - 1. ASTM A82, "Specification for Cold-Drawn Steel Wire for Concrete Reinforcement".
 - 2. ASTM A185, "Specification for Welded Steel Wire Fabric for Concrete Reinforcement".
 - 3. ASTM A615, "Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement".
 - 4. ASTM A706, "Specification for Low Alloy Steel Deformed Bars for Concrete Reinforcement".

1.03 QUALITY ASSURANCE

- A. Codes and Standards: Comply with all applicable Federal, State and Local Code and Safety Regulations. In addition, comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
 - 1. ACI 315, "Details and Detailing of Concrete Reinforcement", latest edition.
 - 2. ACI 318, "Building Code Requirements of Reinforced Concrete", latest edition.

3. AWS D1.4, "Structural Welding Code- Reinforcing Steel", latest edition.
- B. Mill Certificates: The Contractor shall provide Mill Certificates for reinforcing steel in accordance with the requirements of Part 1.05, "Submittals" of this specification section. When Mill Certificates cannot be provided, laboratory test reports shall be provided in accordance with the requirements of Part 1.05, "Submittals" of this specification section.

1.04 SUBMITTALS

- A. Shop Drawings: Shop Drawings shall be submitted that show diagrammatic elevations of all walls, footings, columns, beams, slabs, etc., at a scale sufficiently large to show clearly the positions and erection marks of reinforcing bars, their dowels, and splices. Shop drawings shall also show details for congested areas and connections. Shop Drawings used in field must be reviewed copies.
- B. Product Data: Manufacturer's catalog sheets including instructions for use and description of application shall be provided on each of the following items intended for use on project:
- C. Mechanical anchorage devices for butt splices.
- D. Mill Certificates:
 1. The Contractor shall provide Mill Certificates for each size of bar for each heat to be used on project.
 2. Mill Certificates shall include name of mill, date of rolling, date of shipping to fabricator and shall be signed by fabricator certifying that each material complies with or exceeds the specified requirements. A Mill Certificate shall be furnished with each lot of material delivered to the project and the lot shall be clearly identified in the Certificate.
 3. When Mill Certificates cannot be provided, the Contractor shall hire a professional testing laboratory to verify compliance and provide laboratory test reports. The Contractor shall pay for the cost of testing.
- E. Laboratory Test Reports:
 1. Laboratory test reports shall show the name of testing agency; date of testing, types of tests performed and shall be signed by a principal of the testing agency who is a registered Civil Engineer in the State of California.
 2. When required by other portions of these specifications, laboratory test reports shall be submitted for each size of bar tested for each heat to show compliance with appropriate ASTM Standards and these specifications.

1.05 STORAGE OF MATERIALS

- A. Store reinforcement during fabrication and at site to avoid excessive rusting or coating with grease, oil, dirt, or other objectionable materials.

1.06 SEQUENCING AND SCHEDULING

- A. Coordinate work with all trades so as not to interfere with the work of other trades. Bring interferences between trades to City's attention and resolve before any concrete is placed.

PART 2 PRODUCTS**2.01 REINFORCING BARS**

- A. Bars for reinforcement listed below shall conform to the requirements of ASTM A706, Grade 60.
 - 1. Chord Bars
 - 2. Vertical Bars, Columns
 - 3. Vertical Bars, Pilasters
 - 4. Vertical and Horizontal Bars in Shear Walls, except Ties
 - 5. All Reinforcing Bars to be Welded
- B. Bars for reinforcement not noted above shall be deformed grade steel conforming to the requirements of ASTM A706 or A615, Grade 60.

2.02 WIRE

- A. All wire for concrete reinforcement shall conform to "Specifications for Cold-Drawn Steel Wire for Concrete Reinforcement," ASTM A82.

2.03 MESH

- A. All wire fabric mesh shall conform to "Specifications for Wire Fabric for Concrete Reinforcement," ASTM A185.

2.04 WELDING ELECTRODES

- A. Welding electrodes shall be per Table 5-1 of AWS D1.4.

2.05 MECHANICAL COUPLING DEVICES

- A. Mechanical coupling devices shall develop 125 percent of the minimum yield strength of the bars spliced.

2.06 OTHER MATERIALS

- A. All other materials, not specifically described by these specifications but required for complete and proper placement of reinforcement shall be new, first quality of their respective kinds, and subject to the approval of the ENGINEER.

PART 3 EXECUTION**3.01 EXISTING CONDITIONS**

- A. Prior to all work of the section, carefully inspect the installed work of other trades and verify that all work is sufficiently complete to permit the start of work under this section and that the completed work of this section will be in complete accordance with the original design and the reviewed shop drawings. In the event of discrepancy, immediately notify the City in writing.
- B. In the event conduits, pipes, inserts, sleeves, or any other items interfere with placing the reinforcement as indicated on the drawings or approved shop drawings, or as otherwise required, immediately notify the City and obtain approval on procedure before placement of reinforcement is started.

3.02 BENDING

- A. Bends for reinforcing steel shall be made in accordance with ACI 318 latest edition. Bend all bars cold. Do not field bend reinforcing steel in a manner that will injure material, cause the bars to be bent on too tight a radius, or that is not indicated as allowed on drawings or permitted by Engineer. Do not straighten bent or kinked bars for use on project without permission of Engineer. Replace bars with kinks or bends not shown on the drawings.

3.03 PLACING

- A. All reinforcement shall be placed in strict conformity with the requirements of the engineering drawings, both as to location, position and spacing of members. It shall be supported and secured against displacement by the use of adequate and proper wire supporting and spacing devices, tie wires, etc. so that it will remain in its proper position in the finished structure.
- B. Preserve clear space between parallel bars of not less than 1 1/2 times the nominal diameter of round bars and in no case let the clear distance be less than 1 1/2 inches nor less than 1-1/3 times the maximum size of aggregate for concrete. Bars placed in shotcrete shall have a minimum clearance between bars of 2 1/2" for No. 5 and smaller and 6 bar diameters for bars larger than No. 5.
- C. Lap splices shall be contact lap splices in accordance with ACI 318 unless noted otherwise on the Contract Drawings. Bars shall be wired together at laps. Wherever possible, stagger splices in adjacent bars. Make all splices in wire fabric at least 1 1/2 meshes wide or 12", which ever is greater. When splicing in areas to receive shotcrete, lap splices shall be non-contact with at least 2" clearance between bars.
- D. Butt splices shall be accomplished by mechanical anchorage devices.
- E. Bars shall not be cut by gas torch.

3.04 CLEANING REINFORCEMENT

- A. Take all means necessary to ensure that steel reinforcement, at the time concrete is placed around it, is completely free from rust, dirt, loose mill scale, oil, paint and all coatings which will destroy or reduce the bond between steel and concrete.

END OF SECTION

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 GENERAL**1.01 SUMMARY**

- A. Section Includes: Cast-in-place concrete.

1.02 REFERENCES

- A. American Concrete Institute (ACI):
1. 318 - Building Code Requirements for Structural Concrete.
 2. Manual of Concrete Practice.
 3. Recommended Practices.
- B. American Society for Testing and Materials (ASTM):
1. C 31 - Practice for Making and Curing Concrete Test Specimens in the Field.
 2. C 33 - Specification for Concrete Aggregates.
 3. C 39 - Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 4. C 40 - Test Method for Organic Impurities in Fine Aggregates for Concrete.
 5. C 42 - Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
 6. C 88 - Test Method of Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
 7. C 94 - Specification for Ready-Mixed Concrete.
 8. C 114 - Test Methods for Chemical Analysis of Hydraulic Cement.
 9. C 131 - Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 10. C 136 - Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 11. C 143 - Test Method for Slump of Hydraulic Cement Concrete.
 12. C 150 - Specification for Portland Cement.
 13. C 157 - Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete.
 14. C 171 - Sheet Materials for Curing Concrete
 15. C 172 - Practice for Sampling Freshly Mixed Concrete.
 16. C 173 - Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

17. C 203 - Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation.
18. C 227 - Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method).
19. C 260 - Specification for Air-Entraining Admixtures for Concrete.
20. C 289 - Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method).
21. C 309 - Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
22. C 311 - Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland-Cement Concrete.
23. C 469 - Test Method for Static Modulus of Elasticity and Poisson's Ratio of Concrete in Compression.
24. C 494 - Specification for Chemical Admixtures for Concrete.
25. C 595 - Specification for Blended Hydraulic Cements.
26. C 618 - Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland-Cement Concrete.
27. D 75 - Practices for Sampling Aggregates.
28. D 1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

1.03 DEFINITIONS

- A. Alkali: Is defined to mean sum of sodium oxide and potassium oxide calculated as sodium oxide.
- B. Hairline Crack: Crack with a crack width of less than 4 thousandths of an inch.

1.04 SYSTEM DESCRIPTION

- A. Performance Requirements:
 1. General:
 - a. Except as otherwise specified, provide concrete composed of portland cement, fine aggregate, coarse aggregate, and water so proportioned and mixed as to produce plastic, workable mixture in accordance with requirements as specified in this Section and suitable to specific conditions of placement.
 - b. Proportion materials in manner such as to secure lowest water-cement ratio which is consistent with good workability, plastic, cohesive mixture, and one which is within specified slump range.
 - c. Proportion fine and coarse aggregate in manner such as not to produce harshness in placing nor honeycombing in structures.

2. Watertightness of Concrete Work: It is intent of this Section to secure for every part of the Work concrete and grout of homogeneous structure, which when hardened will have required strength, watertightness, and durability.
 - a. It is recognized that some surface hairline cracks and crazing will develop in the concrete surfaces.
 - b. Construction, contraction, and expansion joints have been positioned in structures as indicated on the Drawings, and curing methods specified, for purpose of reducing number and size of these expected cracks, due to normal expansion and contraction expected from specified concrete mixes.
 - c. Class A and Class B Concrete: Watertight: Repair cracks which develop in walls or slabs and repair cracks which show any signs of leakage until all leakage is stopped.
 - d. Walls or slabs, as specified above, that leak or sweat because of porosity or cracks too small for successful pressure grouting: Seal on water or weather side by coatings of surface sealant system, as specified in this Section.
 - e. Grouting and Sealing: Continue as specified above until structure is watertight and remains watertight for not less than one year after final acceptance or date of final repair, whichever occurs later in time.
3. Workmanship and Methods: Provide concrete work, including detailing of reinforcing, conforming with best standard practices and as set forth in ACI 318, Manuals, and Recommended Practices.

1.05 SUBMITTALS

- A. Product Data: Submit data completely describing products.
- B. Information on Heating Equipment to Be Used for Cold Weather Concreting: Submit information on type of equipment to be used for heating materials and/or new concrete in process of curing during excessively cold weather.
- C. For conditions that promote rapid drying of freshly placed concrete such as low Humidity, high temperature, and wind: Submit corrective measures proposed for use prior to placing concrete.
- D. Copies of Tests of Concrete Aggregates: Submit certified copies in triplicate of commercial laboratory tests of all samples of concrete aggregates.
 1. Fine Aggregate:
 - a. Clay lumps.
 - b. Reactivity.
 - c. Shale and chert.
 - d. Soundness.
 - e. Color.

- f. Decantation.
- 2. Coarse Aggregate:
 - a. Clay lumps and friable particles.
 - b. Reactivity.
 - c. Shale and chert.
 - d. Soundness.
 - e. Abrasion loss.
 - f. Coal and lignite.
 - g. Materials finer than 200 sieve.
- E. Sieve Analysis: Submit sieve analyses of fine and coarse aggregates being used in triplicate at least every 3 weeks and at any time there is significant change in grading of materials.
- F. Concrete Mixes: Submit full details, including mix design calculations for concrete mixes proposed for use for each class of concrete.
 - 1. Include information on correction of batching for varying moisture contents of fine aggregate.
 - 2. Submit source quality test records with mix design submittal.
 - a. Include calculations for f'_c based on source quality test records.
- G. Change in Aggregate Source, or Aggregate Quality from Same Source: Submit new set of design mixes covering each class of concrete.
- H. Test Batch Test Data:
 - 1. Submit data for each test cylinder.
 - 2. Submit data that identifies mix and slump for each test cylinder.
- I. Sequence of Concrete Placing: Submit proposed sequence of placing concrete showing proposed beginning and ending of individual placements.
- J. Curing Compound Other than Specified Compound: Submit complete data on proposed compound.
- K. Repair of Defective Concrete: Submit mix design for grout.
- L. Acceptance of Method of Concrete Repair: Make no repair until the ENGINEER has accepted method of preparing surfaces and proposed method of repair.
- M. If Either Fine or Coarse Aggregate Is Batched from More than One Bin: Submit analyses for each bin, and composite analysis made up from these, using proportions of materials to be used in mix.
- N. Cement Mill Tests: Include alkali content, representative of each shipment of cement for verification of compliance with specified requirements.

- O. Pozzolan Certificate of Compliance: Identify source of pozzolan and certify compliance with requirements of ASTM C 618.
- P. Information on mixing equipment.
- Q. Drying shrinkage test data.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Packing and Shipping:
 - 1. Deliver, store, and handle concrete materials in manner as to prevent damage and inclusion of foreign substances.
 - 2. Deliver and store packaged materials in original containers until ready for use.
 - 3. Deliver aggregate to mixing site and handle in such manner that variations in moisture content will not interfere with steady production of concrete of specified degree of uniformity and slump.
- B. Acceptance at Site: Reject material containers or materials showing evidence of water or other damage.

1.07 PROJECT CONDITIONS

- A. Environmental Requirements:
 - 1. Hot Weather Concreting:
 - a. When Ambient Air Temperature Is above 90 Degrees Fahrenheit: Prior to placing concrete, cool forms and reinforcing steel to by water cooling to below 90 degrees Fahrenheit.
 - b. Temperature of Concrete Mix at Time of Placement: Keep temperature below 90 degrees Fahrenheit by methods which do not impair quality of concrete.
 - 2. Cold Weather Concreting:
 - a. Concrete placed below ambient air temperature of 45 degrees Fahrenheit and falling or below 40 degrees Fahrenheit: Make provision for heating water.
 - b. If materials have been exposed to freezing temperatures to degree that any material is below 35 degrees Fahrenheit: Heat such materials.
 - c. Heating Water, Cement, or Aggregate Materials:
 - 1) Do not heat in excess of 160 degrees Fahrenheit.
 - d. Protection of Concrete in Forms:
 - 1) Protect by means of covering with tarpaulins, or other acceptable covering.
 - 2) Provide means for circulating warm moist air around forms in manner to maintain temperature of 50 degrees Fahrenheit for at least 5 days.

- 3. For conditions that promote rapid drying of freshly placed concrete such as low humidity, high temperature, and wind: Take corrective measures to minimize rapid water loss from concrete.
 - a. Furnish and use sufficient number of maximum and minimum self-recording thermometers to adequately measure temperature around concrete.

1.08 SEQUENCING AND SCHEDULING

- A. Schedule placing of concrete in such manner as to complete any single placing operation to construction, contraction, or expansion joint.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Aggregate:
 - 1. General:
 - a. Provide concrete aggregates that are sound, uniformly graded, and free of deleterious material in excess of allowable amounts specified.
 - b. Grade aggregate in accordance with ASTM D 75 and C 136.
 - c. Provide unit weight of fine and coarse aggregate which produces in place concrete with weight of not less than 140 pounds per cubic foot.
- B. Fine Aggregate:
 - 1. Provide fine aggregate for concrete or mortar consisting of clean, natural sand or of sand prepared from crushed stone or crushed gravel.
 - 2. Do not provide aggregate having deleterious substances in excess of following percentages by weight of contaminating substances. In no case shall total exceed percent listed.

Item	Test Method	Percent
Removed by decantation (dirt, silt, etc.)	ASTM C 117	3
Shale or Chert	ASTM C 295	1
Clay Lumps	ASTM C 142	1

- 3. Except as otherwise specified, grade fine aggregate from coarse to fine in accordance with requirements of ASTM C 33.

- C. Coarse Aggregate:
 - 1. General: Provide coarse aggregate consisting of gravel or crushed stone made up of clean, hard, durable particles free from calcareous coatings, organic matter, or other foreign substances.

- 2. Weight: Not exceeding 15 percent, for thin or elongated pieces having length greater than 5 times average thickness.
- 3. Deleterious Substances: Not in excess of following percentages by weight, and in no case having total of all deleterious substances exceeding 2 percent.

Item	Test Method	Percent
Shale or chert	ASTM C 295	1
Coal and lignite	ASTM C 123	1/4
Clay lumps and friable particles	ASTM C 142	1/4
Materials finer than Number 200 sieve	ASTM C 117	1/2*
* Except when material finer than Number 200 sieve consists of crusher dust, maximum amount shall be 1 percent.		

- 4. Grading:
 - a. Aggregate: As specified in ASTM C 33, Size Number 57, except as otherwise specified or authorized in writing by the ENGINEER.
 - b. Aggregate for Class CE Concrete for Encasement of Electrical Conduits:
 - 1) Graded as specified in ASTM C 33, Size Number 8.
 - 2) Provide concrete utilizing this aggregate equal to Class C concrete in all other respects, and is designated as Class CE.

D. Portland Cement:

- 1. General: Conform to specifications and tests for ASTM C 150, Types II or III, Low Alkali, except as specified otherwise.
- 2. Low Alkali Portland: Have total alkali containing not more than 0.60 percent.
- 3. Exposed Concrete in Any Individual Structure: Use only one brand of portland cement.
- 4. Cement for Finishes: Provide cement from same source and of same type as concrete to be finished.

E. Admixtures:

- 1. General:
 - a. Do not use admixtures of any type, except as specified, unless written authorization has been obtained from the ENGINEER.
 - b. Compatible with concrete and other admixtures.
 - c. Do not use admixtures containing chlorides calculated as chloride ion in excess of 0.5 percent by weight.

- d. Use in accordance with manufacturer's recommendations and add each admixture to concrete mix separately.
2. Air Entraining Admixture:
 - a. Provide all concrete with 5 percent, plus or minus 1 percent, entrained air of evenly dispersed air bubbles at time of placement.
 - b. Conform to ASTM C 260.
 3. Pozzolan Admixture:
 - a. Fly Ash Pozzolan:
 - 1) Conforming to requirements of ASTM C 618, Class F, may be used as admixture in concrete made with Type II portland cement.
 - 2) Pozzolan may replace portland cement at ratio of 1.0 pound fly ash for each pound of portland cement replaced.
 - 3) Maximum of 15 percent by weight of minimum quantities of portland cement listed in Table A under paragraph 2.03E may be replaced with fly ash pozzolan.
 - 4) Do not use pozzolan as an admixture in concrete made with portland-pozzolan cement.
 - 5) Loss on Ignition for Pozzolan: Not exceed four percent.
 - b. Ground granulated blast-furnace slag, grades 100 or 120, complying with ASTM C989 may substitute for portland cement up to a maximum of 25% of the total cementitious material by weight.
 - c. Substitutions that combine fly ash and ground granulated blast-furnace slag are limited to a combined total of 30% of the total cementitious material by weight with fly ash no more than 15% of the total.
 4. Water Reducing Admixture:
 - a. May be used at the CONTRACTOR's option.
 - b. Conform to ASTM C 494, Type A or Type D.
 - c. Not contain air entraining agents.
 - d. Liquid form before adding to the concrete mix.
 - e. No decrease in cement is permitted as result of use of water reducing admixture.
 5. Concrete Waterproofing Admixture:
 - a. An acrylic polymer specifically designed for use as an integral waterproofing admixture shall be added to portland cement concrete at the time of batching.
 - 1) Xycrylic Admix as manufactured by Xypex Chemical Corporation, or an approved equal.
 6. Superplasticizers: Are not to be used without acceptance by ENGINEER.
- F. Water:

1. Water for Concrete, Washing Aggregate, and Curing Concrete: Clean and free from oil and deleterious amounts of alkali, acid, organic matter, or other substances.
 2. Chlorides and Sulfate Ions:
 - a. Water for Conventional Reinforced Concrete: Use water not containing more than 1,000 milligrams per liter of chlorides calculated as chloride ion, nor more than 1,000 milligrams per liter of sulfates calculated as sulfate ion.
- G. Conduit Encasement Coloring Agent:
1. Color: Red color concrete used for encasement of electrical ducts, conduits, similar type items.
 2. Manufacturers: One of the following or equal.
 - a. Frank D. Davis Company, Red Oxide Number 1117.
 - b. I. Reiss Company, Inc., equivalent product.
- H. Keyway Material: Steel, plastic, or lumber.
- I. Sprayed Membrane Curing Compound: Clear type with fugitive dye conforming to ASTM C 309, Type 1D.
- J. Surface Sealant System: Manufacturers: One of the following or equal:
1. Radcon Laboratories, Inc., Las Vegas, Nevada, Formula Number 7.
 2. IPA Systems, Philadelphia, Pennsylvania, Duripal.

2.02 EQUIPMENT

- A. Mixing Concrete:
1. Mixers may be of stationary plant, paver, or truck mixer type.
 2. Provide adequate equipment and facilities for accurate measurement and control of materials and for readily changing proportions of material.
 3. Mixing Equipment:
 - a. Capable of combining aggregates, cement, and water within specified time into thoroughly mixed and uniform mass and of discharging mixture without segregation.
 - b. Maintain concrete mixing plant and equipment in good working order and operated at loads, speeds, and timing recommended by manufacturer or as specified.
 - c. Proportion cement and aggregate by weight.
- B. Machine Mixing:
1. Batch plant shall be capable of controlling delivery of all material to mixer within 1 percent by weight of individual material.

2. If bulk cement is used, weigh it on separate visible scale which will accurately register scale load at any stage of weighing operation from zero to full capacity.
 3. Prevent cement from coming into contact with aggregate or with water until materials are in mixer ready for complete mixing with all mixing water.
 4. Procedure of mixing cement with sand or with sand and coarse aggregate for delivery to project site, for final mixing and addition of mixing water will not be permitted.
 5. Retempering of concrete will not be permitted.
 6. Discharge entire batch before recharging.
 7. Volume of Mixed Material Per Batch: Not exceed manufacturer's rated capacity of mixer.
 8. Mixers:
 - a. Perform mixing in batch mixers of acceptable type.
 - b. Equip each mixer with device for accurately measuring and indicating quantity of water entering concrete, and operating mechanism such that leakage will not occur when valves are closed.
 - c. Equip each mixer with device for automatically measuring, indicating, and controlling time required for mixing.
 - 1) Interlock device to prevent discharge of concrete from mixer before expiration of mixing period.
- C. Transit-mixed Concrete:
1. Mix and deliver in accordance with ASTM C 94.
 2. Total Elapsed Time Between Addition of Water at Batch Plant and Discharging Completed Mix: Not to exceed 90 minutes or elapsed time at project site shall not exceed 30 minutes.
 3. Under conditions contributing to quick setting, total elapsed time permitted may be reduced by the ENGINEER.
 4. Equip each truck mixer with device interlocked so as to prevent discharge of concrete from drum before required number of turns and furnish such device that is capable of counting number of revolutions of drum.
 5. Continuously revolve drum after it is once started until it has completely discharged its batch.
 - a. Do not admit water until drum has started revolving.
 - b. Right is reserved to increase required minimum number of revolutions or to decrease designated maximum number of revolutions allowed, if necessary, to obtain satisfactory mixing. The CONTRACTOR will not be entitled to additional compensation because of such increase or decrease.
- D. Other Types of Mixers: In case of other types of mixers, mixing shall be as follows:

1. Mix concrete until there is uniform distribution of materials, and discharge mixer completely before recharging.
2. Neither speed nor volume loading of mixer shall exceed manufacturer's recommendations.
3. Continue mixing for minimum of 1-1/2 minutes after all materials are in drum, and for batches larger than one cubic yard increase minimum mixing time 15 seconds for each additional cubic yard or fraction thereof.

2.03 MIXES

A. Measurements of Materials:

1. Measure materials by weighing, except as otherwise specified or where other methods are specifically authorized in writing by the ENGINEER.
2. Furnish apparatus for weighing aggregates and cement that is suitably designed and constructed for this purpose.
3. Accuracy of Weighing Devices: Furnish devices that have capability of providing successive quantities of individual material that can be measured to within one percent of desired amount of that material.
4. Measuring or Weighing Devices: Subject to review by the ENGINEER, and bear valid seal of the Sealer of Weights and Measures having jurisdiction.
5. Weighing Cement:
 - a. Weigh cement separately.
 - b. Cement in Unbroken Standard Packages (Sacks): Need not be weighed.
 - c. Bulk Cement and Fractional Packages: Weigh such cement.
6. Mixing Water: Measured by volume or by weight.

B. Concrete Proportions and Consistency:

1. Concrete Consistency and Composition:
 - a. Provide concrete that can be worked readily into corners and angles of forms and around reinforcement without excessive vibration and without permitting materials to segregate or free water to collect on surface.
 - b. Prevent unnecessary or haphazard changes in consistency of concrete.
2. Ratio of Coarse Aggregate to Fine Aggregate: Not less than 1.0 nor more than 2.0 for all concrete Classes, with exception of Class CE.
3. Aggregate:
 - a. Obtain aggregate from source which is capable of providing uniform quality, moisture content, and grading during any single day's operation.

4. Concrete Mix Water to Cement Ratio, Minimum Cement Content, and Slump Range: Conform to values specified in Table A in this Section.
 5. Concrete Batch Weights: Control and adjust so as to secure maximum yield, and at all times maintain proportions of concrete mix within specified limits.
 6. Mixture Modification: If required, by the ENGINEER, modify mixture within limits set forth in this Section.
- C. Concrete Mixes:
1. Proportioning of Concrete Mix: Proportion mixes on required average on compressive strength $f'_{c,r}$ as defined in Subparagraph 2.04A2.
 2. Mixes:
 - a. Adjusting of Water: After acceptance, do not change mixes without acceptance by ENGINEER, except that at all times adjust batching of water to compensate for free moisture content of fine aggregate.
 - b. Total Water Content of Each Concrete Class: Not exceed those specified in Table A in this Section.
 - c. Checking Moisture Content of Fine Aggregate: Furnish satisfactory means at batching plant for checking moisture content of fine aggregate.
 3. Change in Mixes: Undertake new trial batch and test program as specified in this Section.
- D. Hand Mixed Concrete:
1. Hand mix concrete only when acceptable to the ENGINEER.
 2. Prepare hand mixed concrete on watertight, level platform in batches not to exceed 1/3 cubic yard each.
 3. Aggregate:
 - a. First spread required amount of coarse aggregate on platform in an even and uniform layer, and then over such aggregate spread proper proportion of fine aggregate.
 - b. Combined Depth of Both Such Layers: Not be greater than one foot.
 4. Cement:
 - a. First evenly spread required quantity of cement over fine aggregate.
 - b. Then turn entire batch with shovels at least twice before adding water.
 5. Water:
 - a. Then uniformly sprinkle or spray proper amount of water over batched materials.
 - b. Then turn with shovels not less than three times before being removing from platform.
- E. Classes of Concrete:

1. Provide concrete consisting of 5 classes, referred herein as Classes A, B, C, D, and CE specified in this Section and use where specified or indicated on the Drawings.
2. Weight of Concrete Classes: Provide classes of concrete having minimum weight of 140 pounds per cubic foot.
3. Class B Concrete: Class B concrete may be substituted for Class A concrete, when high-early strength concrete is needed in areas specifically accepted by the ENGINEER and that do not require sulfate resistant concrete.
4. Class C Concrete: Class C concrete may be used for fill for unauthorized excavation, for thrust blocks and ground anchors for piping, for bedding of pipe, and where indicated on the Drawings.
5. Class D Concrete: Use Class D for precast concrete items.
6. Class CE Concrete: Use Class CE for electrical conduit encasements.
7. Concrete slabs and all other concrete, unless specified or otherwise indicated on the Drawings: Use Class A concrete.

"TABLE A" CONCRETE WITH AIR ENTRAINMENT				
Class	Specified Compressive Strength f'c at 28 Days (Pounds per Square Inch)	Maximum Net Water to Cement Ratio	Minimum Cement per Cubic Yard of Concrete by Weight (Pounds)	Slump Range (Inches)
A	4,000	0.45	564	2 to 4*
B (Type III cement)	4,000	0.45	564	2 to 4*
C	2,500	0.62	423	3 to 6
D	4,500	0.45	658	2 to 4
CE	2,500	0.62	564	3 to 6
* NOTE: Slump for slabs, decks, walks, and beams shall be not more than 3-1/2 inches.				

8. Pumped Concrete: Provide pumped concrete that complies with all requirements of this Section.
9. Do not place concrete with slump outside limits indicated in Table A.
10. Classes:
 - a. Classes A, C, D, and CE Concrete: Make with Type II low alkali cement.
 - b. Class B Concrete: Make with Type III low alkali cement.

- c. Admixtures: Provide admixtures as specified in this Section.
- F. Air Entraining Admixture:
- 1. Add agent to batch in portion of mixing water.
 - 2. Batch solution by means of mechanical batcher capable of accurate measurement.

2.04 SOURCE QUALITY CONTROL

- A. Tests:
- 1. Concrete Mixes:
 - a. After concrete mixes have been accepted by ENGINEER, have trial batches of the accepted Class A, Class B, and Class D concrete mix designs prepared by testing laboratory acceptable to the ENGINEER.
 - b. Prepare trial batches by using specified cement and aggregates proposed to be used for the Work.
 - c. Trial Batches: Provide batches of sufficient quantity to determine slump, workability, consistency, and finishing characteristics, and to provide sufficient test cylinders.
 - d. Test Cylinders: Provide cylinders having six inch diameter by 12 inch length and that are prepared in accordance with ASTM C 31 for tests specified in this Section.
 - e. Determine slump in accordance with ASTM C 143.
 - f. Test Cylinders from Trial Batch:
 - 1) Test 8 cylinders for compressive strength in accordance with ASTM C 39.
 - a) Test 4 cylinders at 7 days and 4 at 28 days.
 - b) Establish ratio between 7 day and 28 day strength for mix. Seven day strength may be taken as satisfactory indication of 28 day strength provided effects on concrete of temperature and humidity between 7 day and 28 day are taken into account.
 - 2) Average Compressive Strength of 4 Test Cylinders Tested At 28 Days: Equal to or greater than required average compressive strength f'_{cr} on which concrete mix design is based.
 - g. Drying Shrinkage:
 - 1) Prepare 5 drying shrinkage specimens in accordance with ASTM C 157, except as modified herein.
 - 2) Remove drying shrinkage specimens from molds at age of 23 hours plus or minus 1 hour after trial batching, then immediately place them in water at 73 degrees Fahrenheit plus or minus 3 degrees for at least 30 minutes and then measure specimens within 30 minutes thereafter to determine original length. Then submerge specimens in saturated lime water at 73 degrees Fahrenheit plus or minus three degrees for moist curing.

- 3) Make measurement to determine expansion expressed as percentage of original length at age 7 days. Use length at age 7 days as base length for drying shrinkage calculations.
 - 4) Immediately store specimens in humidity controlled room maintained at 73 degrees Fahrenheit plus or minus 3 degrees and 50 percent plus or minus 4 relative humidity for remainder of test.
 - 5) Make and report measurements to determine shrinkage expressed as percentage of base length separately for 7, 14, 21, and 28 days of drying after 7 days of moist curing.
 - 6) Drying Shrinkage Deformation:
 - a) Measure drying shrinkage deformation of each specimen as difference between base length and length after drying at each test age.
 - b) Measure average drying shrinkage deformation of specimens to nearest 0.0001 inch at each test age.
 - c) If drying shrinkage of any specimen departs from average of test age by more than 0.0004 inch, disregard results obtained from that specimen and test another specimen.
 - d) Shrinkage of trial batch concrete at 28 days drying age shall not exceed 0.045 percent maximum.
 - h. If trial batch tests do not meet specified requirements for slump, strength, workability, consistency, drying shrinkage, and finishing, change concrete mix design proportions and, if necessary, source of aggregate. Make additional trial batches and tests until an acceptable trial batch is produced that meets requirements of this Section.
 - i. Perform test batches and tests required to establish trial batches and acceptability of materials without change in Contract Price.
 - j. Do not place concrete until the concrete mix design and trial batch have been accepted by ENGINEER.
2. Required Average Compressive Strength:
- a. Determine required average compressive strength (f'_{cr}) for selection of concrete proportions for mix design, for each class of concrete, using calculated standard deviation and its corresponding specified compressive strength f'_c , in accordance with ACI 318, Part 3, Chapter 5.
 - b. When test records of at least 30 consecutive tests that span period of not less than 45 calendar days are available, establish standard deviation as described in ACI 318, Part 3, Chapter 5 and as modified as follows herein.
 - c. Provide test records from which to calculate standard deviation that represent materials, quality control procedures, and conditions similar to materials, quality control procedures, and conditions expected to apply in preparation of concrete for the Work.
 - d. Provide changes in materials and proportions within test records that are more restricted than those for the Work.

- e. Specified Compressive Strength (f'_c) of Concrete Used in Test Records: Within 1,000 pounds per square inch of that specified for the Work.
- f. When lacking adequate test records for calculation of standard deviation meeting requirements, determine required average compressive strength f'_{cr} from following Table B.

TABLE B	
Specified Compressive Strength f'_c (pounds per square inch)	Required Average Compressive Strength f'_{cr} (pounds per square inch)
Less than 3,000	$f'_c + 1,000$
3,000 to 5,000	$f'_c + 1,200$
Over 5,000	$f'_c + 1,400$

- 3. Pozzolan:
 - a. Sampling and Testing:
 - 1) Sample and test pozzolan in accordance with ASTM C 311.
 - 2) In Computing Water to Cement Ratio And Cement Content Per Cubic Yard Of Concrete: Consider cement weight to be weight of portland cement plus 100 percent of weight of fly ash.
- 4. Aggregate:
 - a. Testing of concrete aggregate is at CONTRACTOR's expense.
 - b. Sieves:
 - 1) Use sieves with square openings for testing grading of aggregates.
 - 2) Sieve Analyses: If sieve analyses indicate significant change in materials, the ENGINEER may require that new mix design be submitted and accepted before further placing of concrete.
 - c. Sample aggregate in accordance with ASTM D 75 and C 136.
 - d. Fine Aggregate:
 - 1) Provide fine aggregate not containing strong alkali nor organic matter which gives color darker than standard color when tested in accordance with ASTM C 40.
 - 2) Provide aggregate having soundness complying with requirements of ASTM C 33 when tested in accordance with ASTM C 88.
 - 3) Provide aggregate complying with reactivity requirements of ASTM C 33 when tested in accordance with ASTM C 289.
 - e. Coarse Aggregate:
 - 1) Soundness when tested in accordance with ASTM C 88: Have loss not greater than 10 percent when tested with sodium sulfate.

- 2) Abrasion Loss: Not exceed 45 percent after 500 revolutions when tested in accordance with ASTM C 131.
 - 3) Reactivity: Not exceed limits specified in Appendix of ASTM C 33 when tested in accordance with ASTM C 289.
- f. Portland Cement:
- 1) Determination Alkali Content: Determine by method set forth in ASTM C 114.

2.05 ACCESSORY MATERIALS

- A. Post-installed anchoring systems:
1. Adhesive anchoring system
 - a. Adhesive anchoring system shall be HILTI-HY 200-R or approved equal with a current ICC/IAPMO evaluation report. Drill and bonding shall be per the adhesive manufacturer's recommendations.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Conduit encasement concrete: Mix into each cubic yard of concrete 10 pounds of coloring agent.
- B. Surface Sealant System: Apply as recommended by manufacturer published instructions. Where concrete continues to sweat or leak, apply additional coats of surface sealant until the sweating or leaks stop.
- C. Joints and Bonding:
1. As far as practicable construct concrete work as monolith.
 2. Locations of contraction, construction, expansion, and other joints are indicated on the Drawings or as specified in this Section.
 3. Construction Joints:
 - a. Where construction joints are not indicated on the Drawings, provide slabs and walls with construction joints at intervals not greater than 30 feet.
 - b. In order to preserve strength and watertightness of structures, make no other joints, except as authorized the ENGINEER.
 - c. At construction joints, thoroughly clean concrete of laitance, grease, oil, mud, dirt, curing compounds, mortar droppings, or other objectionable matter by means of heavy sandblasting, and wash surfaces just prior to succeeding concrete placement.
 - d. At Horizontal Joints: Immediately prior to resuming concrete placing operations, thoroughly spread bed of grout not less than 1/2 inch in thickness, nor more than 1 inch in thickness over horizontal joint surfaces.

4. Keyways in Joints:
 - a. Provide keyways in joints as indicated on the Drawings.
 - b. Treat lumber keyway material with form release coating, applied in accordance with manufacturer's instructions.
 5. Take special care to ensure that concrete is well consolidated around and against waterstops and that waterstops are secured in proper position.
 6. Cleaning of Construction Joints:
 - a. Wash construction joints free of sawdust, chips, and other debris after forms are built and immediately before concrete or grout placement.
 - b. Should formwork confine sawdust, chips, or other loose matter in such manner that it is impossible to remove them by flushing with water, use vacuum cleaner for their removal, after which flush cleaned surfaces with water.
 - c. Provide cleanout hole at base of each wall and column for inspection and cleaning.
 7. Expansion, Contraction, and Construction Joints
 - a. Constructed where and as indicated on the Drawings.
 8. Repair of Concrete: Where it is necessary to repair concrete by bonding mortar or new concrete to concrete which has reached its initial set, first coat surface of set concrete with epoxy bonding agent.
- D. Conveying and Placing Concrete:
1. Convey concrete from mixer to place of final deposit by methods which prevent separation or loss of materials.
 2. Use equipment for chuting, pumping, and conveying concrete of such size and design as to ensure practically continuous flow of concrete at delivery end without separation of materials.
 3. Design and use chutes and devices for conveying and depositing concrete that direct concrete vertically downward when discharged from chute or conveying device.
 4. Keep equipment for conveying concrete thoroughly clean by washing and scraping upon completion of any day's placement.
- E. Placing Concrete:
1. Place no concrete without prior authorization of the ENGINEER.
 2. Do Not Place Concrete Until:
 - a. Reinforcement is securely and properly fastened in its correct position and loose form ties at construction joints have been retightened.
 - b. Dowels, bucks, sleeves, hangers, pipes, conduits, bolts, and any other fixtures required to be embedded in concrete have been placed and adequately anchored.
 - c. Forms have been cleaned and oiled as specified.

3. Placement of concrete in which initial set has occurred, or of retempered concrete, will not be permitted.
4. Place no concrete during rainstorms or high velocity winds.
5. Protect concrete placed immediately before rain to prevent water from coming in contact with such concrete or winds causing excessive drying.
6. Keep sufficient protective covering on hand at all times for protection of concrete.
7. After acceptance, adhere to proposed sequence of placing concrete, except when specific changes are requested and accepted by the ENGINEER.
8. Notify the ENGINEER in writing of readiness, not just intention, to place concrete in any portion of the work.
 - a. Provide this notification in such time in advance of operations as the ENGINEER deems necessary to make final inspection of preparations at location of proposed concrete placing.
 - b. Place forms, steel, screeds, anchors, ties, and inserts in place before notification of readiness is given to the ENGINEER.
 - c. Depositing Concrete:
 - 1) Deposit concrete at or near its final position to avoid segregation caused by rehandling or flowing.
 - 2) Do not deposit concrete in large quantities in one place and work along forms with vibrator or by other methods.
 - 3) Do not drop concrete freely into place from height greater than 5 feet.
 - 4) Use tremies for placing concrete where drop is over 5 feet.
 - 5) Commence placement of concrete on slopes, at bottom of slope.
9. Place concrete in approximately horizontal layers not to exceed 24 inches in depth and bring up evenly in all parts of forms.
10. Continue concrete placement without avoidable interruption, in continuous operation, until end of placement is reached.
11. If more than 20 minutes lapse prior to placement of new concrete over concrete previously placed, reduce depth of layers being placed at one time, and/or increase placing equipment, until it is possible to return with placing operation to previously placed concrete within 20 minutes.
12. If concrete is to be placed over previously placed concrete and more than 20 minutes have elapsed, then spread layer of grout not less than 1/2 inch in thickness nor more than 1 inch in thickness over surface before placing additional concrete.
13. Placement of Concrete for Slabs, Beams, or Walkways:
 - a. If cast monolithically with walls or columns, do not commence until concrete in walls or columns has been allowed to set and shrink.
 - b. Allow set time of not less than one hour for shrinkage.

F. Consolidating Concrete:

1. Place concrete with aid of acceptable mechanical vibrators.
 2. Thoroughly consolidate concrete around reinforcement, pipes, or other shapes built into the work.
 3. Provide sufficiently intense vibration to cause concrete to flow and settle readily into place and to visibly affect concrete over radius of at least 18 inches.
 4. Vibrators:
 - a. Keep sufficient vibrators on hand at all times to vibrate concrete as placed.
 - b. In addition to vibrators in actual use while concrete is being placed, have on hand minimum 1 spare vibrator in serviceable condition.
 - c. Place no concrete until it has been ascertained that all vibrating equipment, including spares, are in serviceable condition.
 5. Take special care to place concrete solidly against forms so as to leave no voids.
 6. Take every precaution to make concrete solid, compact, and smooth, and if for any reason surfaces or interiors have voids or are in any way defective, repair such concrete in manner acceptable to the ENGINEER.
- G. Footings and Slabs on Grade:
1. Do not place concrete on ground or compacted fill until subgrade is in moist condition acceptable to the ENGINEER.
 2. If necessary, sprinkle subgrade with water not less than 6 nor more than 20 hours in advance of placing concrete.
 3. If it becomes dry prior to actual placing of concrete, sprinkle again, without forming pools of water.
 4. Place no concrete if subgrade is muddy or soft.
- H. Loading Concrete:
1. Green Concrete:
 - a. No heavy loading of green concrete will be permitted.
 - b. Green concrete is defined as concrete with less than 100 percent of the specified strength.
 2. No backfill shall be placed against concrete walls until the concrete has reached the specified strength and the connecting slabs and beams have been cast and have reached the specified strength.
 3. Use construction methods, sequencing, and allow time for concrete to reach adequate strength to prevent overstress of the concrete structure during construction.
- I. Curing Concrete:
1. General:

- a. Cure concrete by methods specified in this Section.
 - b. Cure concrete minimum of 7 days.
 - c. Cure concrete to be painted with water or plastic membrane.
 - d. Do not use curing compound on concrete surfaces that are to receive paint or upon which any material is to be bonded.
 - e. Water cure or plastic membrane cure concrete slabs which are specified to be sealed by concrete sealer.
 - f. Cure other concrete by water curing or sprayed curing membrane at the CONTRACTOR's option.
 - g. Floor slabs may be cured using plastic membrane curing.
2. Water Curing:
- a. Keep surfaces of concrete being water cured constantly and visibly moist day and night for period of not less than 7 days.
 - b. Each day forms remain in place may count as 1 day of water curing.
 - c. No further curing credit will be allowed for forms in place after contact has once been broken between concrete surface and forms.
 - d. Do not loosen form ties during period when concrete is being cured by leaving forms in place.
 - e. Flood top of walls with water at least 3 times per day, and keep concrete surfaces moist at all times during 7 day curing period.
3. Sprayed Membrane Curing:
- a. Apply curing compound to concrete surface after repairing and patching, and within 1 hour after forms are removed.
 - b. If more than 1 hour elapses after removal of forms, do not use membrane curing compound, but apply water curing for full curing period.
 - c. If surface requires repairing or painting, water cure such concrete surfaces.
 - d. Curing Compound:
 - 1) Do not remove curing compound from concrete in less than 7 days.
 - 2) Curing compound may be removed only upon written request by the CONTRACTOR and acceptance by the ENGINEER, stating what measures are to be performed to adequately cure structures.
 - 3) Take care to apply curing compound in area of construction joints to see that curing compound is placed within construction joint silhouette.
 - 4) Remove curing compound placed within construction joint silhouette by heavy sandblasting prior to placing any new concrete.
 - 5) CONTRACTOR's Option: Instead of using curing compound for curing of construction joints such joints may be water cured.

- 6) Apply curing compound by mechanical, power operated sprayer and mechanical agitator that will uniformly mix all pigment and compound.
 - 7) Apply compound in at least 2 coats.
 - 8) Apply each coat in direction 90 degrees to preceding coat.
 - 9) Apply compound in sufficient quantity so that concrete has uniform appearance and that natural color is effectively and completely concealed at time of spraying.
 - 10) Continue to coat and recoat surfaces until specified coverage is achieved and until coating film remains on concrete surfaces.
 - 11) Thickness and Coverage of Compound: Provide compound having film thickness that can be scraped from surfaces at any and all points after drying for at least 24 hours.
 - 12) The CONTRACTOR is cautioned that method of applying curing compound specified herein may require more compound than normally suggested by manufacturer of compound and also more than is customary in the trade.
 - 13) Apply amounts specified herein, regardless of manufacturer's recommendations or customary practice, if curing compound is used in place of water curing.
 - 14) If the CONTRACTOR desires to use curing compound other than specified compound, coat sample areas of concrete wall with proposed compound and also similar adjacent area with specified compound in specified manner for comparison.
 - a) If proposed sample is not equal or better, in opinion of the ENGINEER, in all features, proposed substitution will not be allowed.
 - 15) Prior to final acceptance of the work, remove, by sandblasting or other acceptable method, any curing compound on surfaces exposed to view, so that only natural color of finished concrete is visible uniformly over entire surface.
4. Plastic Membrane Curing:
- a. Polyethylene film may be used to cure slabs. Seal joints and edges with small sand berm.
 - b. Install plastic membrane as soon as concrete is finished and can be walked on without damage.
 - c. Keep concrete moist under plastic membrane.

3.02 CONCRETE FINISHING

- A. Provide concrete finishes in accordance the Drawings.
- B. Edges of Joints:
 1. Provide joints having edges as indicated on the Drawings.
 2. Protect wall and slab surfaces at edges against concrete spatter and thoroughly clean upon completion of each placement.
- C. Concrete Sealer:

1. Floors and Slabs to Receive Sealer:
 - a. See Room Finish Schedule.
2. Seal Floors and Slabs at CONTRACTOR's Option:
 - a. All Floor Slabs Except for the Following:
 - 1) Those indicated on the Drawings to receive seamless Floor surfacing.
 - 2) Any slabs which receive concrete or grout surfacing, in lieu of water or curing compound.

3.03 FIELD QUALITY CONTROL

A. Testing of Concrete:

1. During progress of construction, the CITY will have tests made to determine whether the concrete, as being produced, complies with requirements specified.
2. Tests will be performed in accordance with ASTM C 31, ASTM C 39, and ASTM C 172.
3. The CITY's laboratory technician will make and deliver test cylinders to the laboratory for testing.
4. Required Number Cylinders for testing by CITY:
 - a. Not less than 3 cylinder specimens, 6 inch diameter by 12 inch long, will be tested for each 150 cubic yards of each class of concrete with minimum of 3 three specimens for each class of concrete placed and not less than 3 specimens for each half day's placement.
 - b. One cylinder will be broken at 7 days and 2 at 28 days.
5. The CITY's laboratory technician will test slump at the beginning of each placement, as often as necessary to keep slump within the specified range, and when requested to do so by the ENGINEER.
6. The CONTRACTOR shall:
 - a. Coordinate test cylinder sampling with CITY's laboratory technician.
 - b. Coordinate slump tests of concrete with the CITY's laboratory technician, who will use a slump cone in accordance with requirements of ASTM C 143.
 - c. Not use concrete that does not meet specification requirements in regards to slump, but remove such concrete from project site.
 - d. Provide concrete for test specimens when requested by the Engineer for the purposes of Quality Assurance testing.

B. Air Entraining Admixture:

1. Test percent of entrained air in concrete at beginning of each placement, as often as necessary to keep entrained air within specified range, and when requested to do so by the ENGINEER.
2. Provide test equipment.

3. Do not use concrete that does not meet Specification requirements as to air entrainment and shall remove such concrete from project site.
 4. Test air entrainment in concrete in accordance with ASTM C 173.
 5. The ENGINEER may at any time test percent of entrained air in concrete received on project site.
- C. Enforcement of Strength Requirement:
1. Concrete is expected to reach higher compressive strength than that which is indicated in Table A as specified compressive strength $f'c$.
 2. Strength Level of Concrete: Will be considered acceptable if following conditions are satisfied.
 - a. Averages of all sets of 3 consecutive strength test results is greater or equal to specified compressive strength $f'c$.
 - b. No individual strength test (average of 2 cylinders) falls below specified compressive strength $f'c$ by more than 500 pounds per square inch.
 - c. Whenever one, or both, of 2 conditions stated above is not satisfied, provide additional curing of affected portion followed by cores taken in accordance with ASTM C 42 and ACI 318 and comply with following requirements:
 - 1) If additional curing does not bring average of 3 cores taken in affected area to at least specified compressive strength $f'c$, designate such concrete in affected area as defective.
 - 2) The ENGINEER may require the CONTRACTOR to strengthen defective concrete by means of additional concrete, additional reinforcing steel, or replacement of defective concrete, all of the CONTRACTOR's expense.

3.04 ADJUSTING

- A. Repair of Defective Concrete:
1. Remove and replace or repair defective work.
 2. Correct defective work as specified in this Article.
 3. Do not patch, repair, or cover defective work without inspection by the ENGINEER.
 4. Provide repairs having strength equal to or greater than specified concrete for areas involved.
 - a. Chip out and key imperfections in the work and make them ready for repair.
 5. Dry Pack Method:
 - a. Dry Pack Method: Use for holes having depth nearly equal to or greater than least surface dimension of hole, for cone-bolt, and narrow slots cut for repair.

- b. Smooth Holes: Clean and roughen by heavy sandblasting before repair.
- 6. Mortar Method of Replacement: Use for following:
 - a. Holes too wide to dry pack and too shallow for concrete replacement.
 - b. Comparatively shallow depressions, large or small, which extend no deeper than reinforcement nearest surface.
- 7. Concrete Replacement:
 - a. Use: When holes extend entirely through concrete section or when holes are more than 1 square foot in area and extend halfway or more through the section.
 - b. Method of Repair for Surfaces of Set Concrete to Be Repaired: First coat with epoxy bonding agent.
- 8. Acceptable Method of Concrete Repair:
 - a. Make no repair until the ENGINEER has accepted method of preparing surfaces and proposed method of repair.

END OF SECTION

**SECTION 03400
PRECAST CONCRETE**

PART 1 GENERAL**1.01 DOCUMENTS**

- A. The General Conditions and all other Contract Documents for this project are complementary and applicable to this Section of the Specifications.

1.02 SCOPE OF WORK

- A. Provide all labor, materials, equipment, facilities, transportation and services necessary for the installation of precast concrete structures.
- B. **Work Included:** The work includes, but is not necessarily limited to the following:
 - 1. Manholes and wet well structures, including top slabs.
 - 2. Vaults.
 - 3. Electrical pull/splice boxes.
 - 4. Inserts, sleeves, steps, anchor bolts and other items embedded in precast concrete, whether furnished under this section or other sections.
- C. Related Work Specified Elsewhere
 - 1. Section 02300 – Earthwork
 - 2. Section 03200 – Concrete Reinforcement
 - 3. Section 03300 – Cast-in-Place Concrete

1.03 SUBMITTALS

- A. Shop Drawings: Show the following:
 - 1. Design calculations stamped by a Civil or Structural Engineer registered in the State of California.
 - 2. Reinforcement layout.
 - 3. Concrete mixture.
 - 4. Locations of access doors.

1.04 QUALITY ASSURANCE

- A. California Building Code, latest edition.

- B. American Concrete Institute (ACI), Building Code Requirements for Reinforced Concrete.
- C. Caltrans Standard Specifications, latest edition.

1.05 REFERENCE STANDARDS

- A. Standards listed below are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of listed standards, the requirements of this section shall prevail. Where two or more standards are at variance, the most restrictive requirement shall apply.
 - 1. ASTM C150 – Portland Cement
 - 2. ASTM C478 – Precast Reinforced Concrete Manhole Sections
 - 3. ASTM C858 – Underground Precast Concrete Utility Structures
 - 4. ASTM C913 – Precast Concrete Water/Wastewater Structures
- B. American Association of State Highway Transportation Officials (AASHTO)

PART 2 PRODUCTS

2.01 PRECAST CONCRETE STRUCTURES

- A. For Lift Station J, wet well top slab and valve vault structure shall be designed to withstand AASHTO H-20 loading scenarios.
- B. For Lift Station J, wet well top slab shall be supplied with a factory-installed stainless steel socket embedded in the concrete top slab to accommodate a portable hoist. The socket and top slab shall be designed to support a City-specified portable hoist along with the portable hoist maximum load. Socket shall be of type-316 stainless steel. Socket shall be equipped with a type-316 stainless steel cap to keep it free from debris.
- C. For Lift Station W, valve vault structure shall be designed to withstand AASHTO H-20 loading scenarios.
- D. Where shown on the plans, the Contractor may use reinforced concrete structures that are cast at an off-site location. In general these structures include drop inlets, manholes, vaults and electrical pull boxes. Precast concrete structures shall conform to ASTM C478, C858 and C913.
- E. All precast concrete structures will be manufactured in a plant especially designed for that purpose. Standard products may be used wherever feasible.
- F. Precast concrete structures shall be designed by a Civil or Structural Engineer registered in the State of California. Calculations shall be submitted to the City for approval.

2.02 MATERIALS

- A. Portland cement concrete and steel reinforcement shall conform to these specifications, although concrete compressive strength and reinforcement yield strength may be at the discretion of the manufacturer. Lightweight concrete shall not be used.

2.03 JOINT SEALERS

- A. All joints between precast concrete sections shall be made water-tight by using a preformed plastic material that is permanently self-adhering and flexible. Compound shall be "Ram-Nek" as manufactured by K.T. Snyder Company, Houston, Texas or approved equal. ("Ram-Nek" is distributed locally by Hanson Concrete Products of Milpitas.) Follow manufacturer's recommended installation procedures.
- B. Where cast-in-place concrete is poured against an existing concrete structure, a pre-formed rubber hydrophilic water stop with adhesive back shall be installed on the precast side of the joint prior to the pour. Water stop shall be Adeka Ultra Seal MC-2010M (Gates Unlimited, Santa Clara) or equivalent. Follow manufacturer's recommended installation procedures.

2.04 NON-SHRINK GROUT

- A. Grout used to seal pipe penetrations and support base plates shall be nonmetallic, non-corrosive, non-staining grouting compound containing silica sands, portland cement, shrinkage compensating agents and water reducing agents. Acceptable Products include Five Star Grout, Masterflow, and Upcon Nonshrink.

PART 3 EXECUTION**3.01 CASTING**

- A. No concrete shall be cast until all submittals have been favorably reviewed by the Engineer and returned to the Contractor.
- B. Precast concrete structures shall be cured at the plant following manufacturer's procedures. Structures shall not be shipped to the site until fully cured.

3.02 STORAGE, HANDLING, AND DELIVERY

- A. Precast structures shall be fully braced (with temporary struts if necessary) until the structures have been delivered to the project site, installed, leveled and anchored into place as shown on the plans.
- B. After cure, structures may be stored on the project site at the Contractor's own risk. Contractor is responsible for coordinating the delivery of precast

concrete structures, and all trades required for their installation and anchorage.

3.03 INSTALLATION

- A. Precast concrete structures shall be installed as shown on the plans, according to manufacturer's recommendations.
- B. Joint sealers shall be used as specified herein for a water-tight installation.

3.04 DEFECTIVE CONCRETE AND REPAIRS

- A. Concrete shall be considered defective for the following reasons:
 - 1. Failure of finished concrete profiles to conform to the plans within tolerance.
 - 2. Failure to meet the specified cylinder strength requirements.
 - 3. Concrete showing cracks, rock pockets, voids, spalls, or defects that adversely affect the structural adequacy of the concrete.
- B. Defective concrete that results from improper casting or curing shall be repaired or replaced at the plant prior to shipment; damaged concrete that results from transportation, handling, or storage after the piece leaves the plant shall be repaired or replaced at no expense to the City.
- C. **Repairing and Patching:** Immediately after removing forms, all concrete surfaces shall be inspected and any pour joints, voids, rock pockets, tie holes, except as specified, etc., shall be patched at once. Defective areas shall be chipped away to a depth of about one inch with the edges perpendicular to the surface.

END OF SECTION

**SECTION 05430
SLOTTED CHANNEL FRAMING**

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Channel framing systems and hardware to support piping, mechanical and electrical equipment and devices and electrical conduit support.
- B. Related Sections:
 - 1. Section 15050 – Basic Mechanical Materials and Methods
 - 2. Section 15052 – Basic Piping Materials and Methods

1.02 REFERENCES

- A. American Iron and Steel Institute (ANSI) Specification for the Design of Cold-Formed Steel Structural Members.
- B. American Society for Testing and Materials (ASTM):
 - 1. A 36/A 36M - Specification for Structural Steel.
 - 2. A 123 - Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 3. A 167 - Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - 4. A 276 - Specification for Stainless Steel Bars and Shapes.
 - 5. A 500 - Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - 6. A 501 - Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 - 7. A 569 - Specification for Steel, Carbon (0.15 Maximum, Percent) Hot-Rolled Sheet and Strip Commercial Quality.
 - 8. A 570/A 570M - Specification for Steel, Sheet and Strip, Carbon. Hot-Rolled, Structural Quality.
 - 9. A 635/A 635M - Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot-Rolled.
 - 10. A 653/A 653M - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-coated (Galvannealed) by the Hot-Dip Process.
- C. International Code Council (ICC)/California Building Standards Commission (CBSC):
 - 1. International Building Code (IBC), current governing edition.
 - 2. California Building Code (CBC), current governing edition.

1.03 QUALITY ASSURANCE

- A. Metal framing system and components shall be supplied from a single approved manufacturer.
- B. The manufacturer shall have at least ten year's experience in manufacturing strut type metal framing systems.
- C. Work shall meet the requirements of:
 - 1. Applicable federal, state and local codes.
 - 2. AISI specifications.
 - 3. ASTM specifications.
 - 4. Standards of the Metal Framing Manufacturer's Association (MFMA).

1.04 SUBMITTALS

- A. Shop Drawings: Submit for strut type framing systems, including details on connection attachments.
 - 1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
 - 2. Include erection drawings, elevations, and details where applicable.
 - 3. Indicate bolted connections and anchorage to concrete, steel or masonry.
- B. Pertinent manufacturer's published data.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. All material shall be delivered to the work site in original factory packaging to avoid damage to the finish.
- B. All components shall be protected from the elements.

1.06 WARRANTY

- A. All metal framing systems shall be warranted for a period of one year from the date of CITY's acceptance of the Work.
- B. Defective products shall be repaired or replaced by the Manufacturer.

PART 2 PRODUCTS**2.01 FRAMING SYSTEMS**

- A. Strut systems and components shall be Unistrut or approved equal.

- B. Materials: Unless otherwise specified or indicated on the Drawings, structural and miscellaneous metals shall conform with the standards of the ASTM, including the following:
 - 1. Systems installed indoors and above grade shall be fabricated from structural grade steel conforming to one of the following ASTM specifications.
 - a. A1011 GR33
 - b. A653 GR33
 - 2. Systems installed indoors below grade (including the wet wells and vaults) or outdoors shall be fabricated from structural grade stainless steel conforming to ASTM A240, Type 316.
- C. All fittings shall be compatible with the associated and with ASTM standards including
 - 1. Fittings for use indoors and above grade shall be fabricated from steel conforming to one of the following ASTM specifications and the physical requirements of A1011 GR33:
 - a. A575
 - b. A576
 - c. A36, or
 - d. A635
 - 2. Fittings for use indoors below grade or outdoors shall be fabricated from stainless steel conforming to ASTM A240, Type 316.

2.02 FINISHES

- A. Channels and Fittings for use indoors above grade shall be hot-dipped galvanized per ASTM A123 or A153 after all manufacturing operations are complete. Damaged coating shall be repaired.
- B. Stainless steel channels and fittings shall not be coated.

2.03 HARDWARE

- A. All hardware shall be Type 316 stainless steel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine work in place to verify that it is satisfactory to receive the work of this Section. If unsatisfactory conditions exist, do not begin this work until such conditions have been corrected.

3.02 INSTALLATION

- A. General: Install products as indicated on the Drawings, and in accordance with shop drawings and manufacturer's printed instructions, as applicable except where specified otherwise.
- B. Set metal framing system components into final position true to line, level and plumb, in accordance with approved shop drawings.
- C. Anchor material firmly in place, and tighten all connections to their recommended torques.
- D. Where protection is applied for prevention of dissimilar materials electrolysis, make application such that none of the protective material is visible in the completed assembly.

3.03 CLEANUP

- A. Upon completion of this section of work, remove all protective wraps and debris.
- B. Repair any damage due to installation.

3.04 PROTECTION

- A. During installation protect work from damage.
- B. After installation protect work from damage due to subsequent construction until completion.
- C. Replace damaged or disfigured metal framing systems with new materials.

END OF SECTION

**SECTION 08310
ACCESS DOORS****PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Spring-assist access doors with fall protection.

1.02 SUBMITTALS

- A. Product Data.
- B. Shop Drawings: Show the following:
 - 1. Access door attachment to structure in each typical condition.
 - 2. Locations of access doors.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Identify type and size of each door in way not to damage finish prior to delivery.
- B. Deliver products only after proper facilities are available.
- C. Deliver and store packaged products in original containers with seals unbroken and labels intact until time of use.
- D. Handle carefully to prevent damage and store on clean concrete surface or raised platform in safe, dry area. Do not dump onto ground.
- E. Protect access doors during shipment and storage to prevent warping, bending, and corrosion.

PART 2 PRODUCTS**2.01 FLOOR ACCESS HATCHES**

- A. For Lift Station J wet well and valve vault access hatches, door leaf shall be anodized aluminum diamond pattern; designed to withstand AASHTO H-20 loading scenarios. Maximum deflection shall be 1/150th of the span.
- B. For Lift Station W valve vault access hatches, door leaf shall be anodized aluminum diamond pattern; designed to withstand AASHTO H-20 loading scenarios. Maximum deflection shall be 1/150th of the span.
- C. Channel frame shall be extruded aluminum, to match the hatch material. Frames shall be supplied to concrete precaster so that they may be cast into the concrete. A continuous EPDM gasket shall be mechanically attached to the frame to eliminate dirt and debris from entering the channel frame.

- D. **Hinges:** Heavy forged aluminum hinges, each having a minimum 3/8" diameter Type 316 stainless steel pin, shall be provided and shall pivot so the cover does not protrude into the channel frame. Shall be bolted to channel frame and hatch cover with type 316 stainless steel bolts and Ny-lock nuts
- E. **Drain Coupling:** Provide a 1-1/2" (38mm) drain coupling located in the right front corner of the channel frame (away from the hinges).
- F. **Lifting Mechanisms:** Manufacturer shall provide the required number and size of compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and to act as a check in retarding downward motion of the cover when closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe fastened to a formed 1/4" gusset support plate.
- G. A removable exterior turn/lift handle with a spring loaded ball detent shall be provided to open the cover and the latch release shall be protected by a flush, gasketed, removable screw plug.
- H. Cover shall be equipped with a hold open arm which automatically locks the cover in the open position. A Type 316 stainless steel snap lock with fixed handle shall be mounted on the underside of the cover.
- I. Hardware shall be anticorrosion throughout. Factory finish shall be hot-dipped galvanizing per ASTM standards with bituminous coating applied to the exterior of the frame exposed to cast concrete.
- J. For the rail mounted submersible pump access hatch, provide a "safe hatch system" designed to combine the covering of the access hole per OSHA Standard 1910.23, and include fall through protection and controlled confined space entry. Safety grates shall be made of 6063-T6 aluminum. Aluminum grating shall be designed to withstand a live load as specified by the pump manufacturer, which is determined by the weight of the pump that may be placed on top of the safety grate. Deflection shall not exceed 1/150th of the span. Each grate shall be provided with a permanent hinging system, which will lock the grate in the 90° position once opened. Grates in the open position create a visual barrier around the opening, alerting passing pedestrians.
- K. Each aluminum safety grate shall be coated with a safety orange color, promoting visual awareness of the hazard, by a powder coat system, applied by the electrostatic spray process. The coating is a thermosetting powder coat finish with a minimum thickness of 2 mils-4 mils and shall be baked at 350°-375°F until cured.
- L. Manufacturer shall guarantee against defects in hatch material or workmanship for a period of ten years.
- M. Access hatches shall be as manufactured by Syracuse Castings, or approved equal.

2.02 FINISHES

- A. Floor Access Doors:
 - 1. Aluminum: Manufacturer's standard mill finish.
 - 2. Aluminum in Contact with Dissimilar Metals and Concrete: Manufacturer's standard bituminous coating.
 - 3. Steel: Manufacturer's standard red oxide primer.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Examine construction to receive access door and verify correctness of dimensions and other supporting or adjoining conditions.

3.02 PREPARATION

- A. Coordinate details with other work supporting, adjoining, or requiring access doors.
- B. Verify dimensions, profiles, and fire-resistive rating for each opening.
- C. Verify that location will serve portion of work to which access is required. Where proposed functional location conflicts with other work, notify the Engineer before installation.

3.03 INSTALLATION

- A. Install access doors in accordance with manufacturer's instructions.
- B. Ensure correct types and adequate sizes at proper locations.
- C. Securely attach frames to supporting work and ensure doors, frames and hardware operate smoothly and are free from warp, twist and distortion.

3.04 ADJUSTING

- A. Adjust doors, frames and hardware to operate smoothly, freely, and properly, without binding.

3.05 CLEANING

- A. Thoroughly clean surfaces of grease, oil, or other impurities, touch-up abraded prime coat.

END OF SECTION

**SECTION 09800
COATING SYSTEMS**

PART 1 GENERAL

1.01 DOCUMENTS

- A. The General Conditions and all other Contract Documents for this project are complementary and applicable to this section of the Specifications.

1.02 SCOPE OF WORK

- A. Work Included
1. Paint, protective coatings, and finishes for pipes, exposed metal, and equipment.
- B. Related Work Specified Elsewhere
1. Section 09900 – Wet Well Coating Systems
 2. Section 15050 – Basic Mechanical Materials and Methods
 3. Section 15052 – Basic Piping Materials and Methods

1.03 REFERENCE STANDARDS

- A. Standards listed below are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of listed standards, the requirements of this section shall prevail. Where two or more standards are at variance, the most restrictive requirement shall apply.
1. American Water Works Association (AWWA)
 - a. C105 – Polyethylene Encasement for Ductile-Iron Pipe Systems
 - b. C210 – Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
 - c. C213 – Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines
 2. The Society for Protective Coatings (SSPC)
 - a. PA2 – Measurement of Dry Paint Thickness with Magnetic Gauges
 - b. SP1 – Solvent Cleaning
 - c. SP5 – White Metal Blast Cleaning
 - d. SP6 – Commercial Blast Cleaning
 - e. SP7 – Brush-off Blast Cleaning
 - f. SP8 – Pickling
 - g. SP10 – Near-white Blast Cleaning

1.04 SUBMITTALS

- A. Complete data on each type of paint and primer shall be submitted to the Engineer demonstrating the product's compliance with these specifications. This shall be done whether or not the product is named herein. Submittals shall also include manufacturer's published instructions and indicate where or for what use each product is intended. The Contractor shall be in receipt of the Engineer's written approval prior to delivery of any paint to the job-site.
- B. Paints not listed in the specifications shall be submitted with a certified ingredients analysis and with solids by volume so that a complete comparison between specified and proposed paint may be made. Certification of compliance with State of California Air Regulation Board standards shall be submitted.
- C. Contractor shall provide color chips for approval. City will select all colors.

PART 2 PRODUCTS**2.01 GENERAL**

- A. The paints, primers, and coatings shall be the products of the Tnemec Company Inc., North Kansas City, MO, or equal. The "or equal" clause refers to dry film thickness, generic type of primer, paint, or coating and ingredients in the coating. No request for substitution will be considered which decreases the film thickness designated, the number of coats to be applied, the general type of coating, paint, or primer; or the quantity, quality or type of ingredients in the coatings specified. Paints shall meet current State of California Air Regulation Board standards.

2.02 PIPE COATING SYSTEMS

- A. Pipe and Fittings: All pump discharge piping, associated fittings shall be fusion bonded epoxy lined and coated as specified herein unless otherwise specified. Additional ferrous metals for immersed service shall also be fusion bonded epoxy lined and coated.
- B. Buried Pipe and Fittings: Ferric discharge piping and associated fittings for buried service shall be coated in conformance with these specifications and in addition, shall be wrapped with 8 mil polyethylene in conformance with AWWA C105. Prior to encasement, odd shaped items such as couplings, flange bolts, restraining glands, etc. shall be coated with a bitumastic material (e.g. Ramnek) to provide a uniform substrate that prevents film tearing during backfill.

2.03 FERROUS METAL COATINGS FOR NON-IMMERSION SERVICE

- A. Ferrous Metals for Non-Immersion Service: Exposed metals including steel canopy members and ferrous metal not called out elsewhere shall be coated with the following system, following manufacturer's recommendations:
 - 1. Surface Preparation: Sandblast to SSPC 6 (commercial blast cleaning).

2. Prime Coat: Blasted surfaces shall be coated with a 2.5 to 3.5 mil DFT coat of zinc-rich aromatic urethane, such as Tnemec Series 90-97 Tneme-Zinc, or approved equal.
 3. Intermediate Coat: Primed surfaces shall be coated with a 2.0 to 3.0 mil DFT coat of polyamidoamine epoxy, such as Tnemec Series N69 High-Build Epoxoline II, or approved equal.
 4. Top Coat: A 2.0 to 5.0 mil DFT coat of aliphatic acrylic polyurethane such as Tnemec Series 1074 Endura-Shield II, or approved equal.
- B. All prime and intermediate coats shall be compatible as recommended by the manufacturer. City shall select finished top coat color from manufacturer's standard colors.

2.04 SANITARY SEWER CONCRETE STRUCTURES

- A. Sanitary sewer concrete structures to be coated where called out on the Plans shall be coated per Section 09900.

PART 3 EXECUTION

3.01 GENERAL

- A. All materials shall be delivered to the site in the manufacturer's sealed containers. Each container shall be labeled by the manufacturer, and the label shall be intact upon delivery. Labels shall give the manufacturer's name, brand, type of paint, batch number, color of paint and instructions for reducing. Materials shall not be delivered until the Engineer's written approval has been received.
- B. Each coat of paint shall be of the consistency as supplied by the manufacturer, or thinned if necessary, and applied in accordance with the manufacturer's written instructions. Work shall be free from "runs", "bridges", "shiners", or other imperfections due to faulty intervals. Care shall be taken to obtain a uniform, unbroken coating over all bolts, threads, nuts, welds, edges, and corners. Further, all weld splatter shall be removed and all welds neutralized with thinner.
- C. Care shall be exercised not to damage adjacent work during sandblasting operations. Stainless steel need not be sandblasted. Blasted surfaces shall be coated within four hours of being sandblasted. All dust shall be removed from the surfaces prior to painting.

3.02 ENVIRONMENTAL CONDITIONS

- A. Paint shall not be applied in extreme heat, nor in dust or smoke laden air, nor in damp or humid weather, nor when the air temperature and/or the temperature of the surface to be painted is below 50-deg F or within 10-deg F of the dew point. The Contractor shall provide temporary heat as required to maintain 50-deg F temperature and 10-deg F above the dew point day and night until painting is complete and the paint is dry.

- B. Paint shall not be applied to surfaces hotter than 120-deg F.

3.03 GENERAL SURFACE PREPARATION

- A. All surfaces to be coated or painted shall be in the specified condition to receive the material before any coating or painting is performed. No more sandblasting or surface preparation than can be coated or painted in a normal working day will be permitted. All sharp edges, burrs and weld spatter shall be removed.

3.04 INSPECTION AND GUARANTEE

- A. During and after final application of protective coatings, all metal surfaces shall be checked mechanically with an Elcometer, Mikrotest or other approved dry film thickness gage to insure that the specified dry film thickness has been attained.
- B. Coating testing and repair of damages, flawed areas, holidays, or mishaps shall conform to applicable AWWA standards.
- C. The Contractor shall guarantee all coating work for a period of one year following the date of final acceptance by the City and is hereby notified that the City will inspect the project prior to the expiration of the guarantee period. The Contractor will be notified of the eleventh month inspection by certified letter and asked to attend. Defects in workmanship and materials shall be repaired by the Contractor at no cost to the City.

3.05 PAINT SCHEDULE

- A. Items for Coating: Items shall be coated as specified herein.
- B. Factory Painted Equipment: Except as otherwise noted in the specifications, the following shall receive final finish coats at the factory. Paint shall conform to these specifications for appropriate service. Any areas damaged during shipment, installation, or initial testing shall be refinished as the original at no extra cost to the City. Factory painted items shall be of a color approved by the City.
 - 1. Pump Station Pedestal
 - 2. Engine-Generator Set
 - 3. Pump termination panels
- C. Items Not Painted: Unless otherwise specified, the following items shall not be painted:
 - 1. Aluminum, brass, bronze, copper, plastic, rubber, stainless steel, chrome or lead
 - 2. Plastic pipe and conduit
 - 3. Galvanized steel framing and plates
 - 4. Nameplates

5. Warning or operating instruction labels
6. Gages
7. Concrete

END OF SECTION

**SECTION 09900
WET WELL COATING SYSTEM**

PART 1 GENERAL

1.01 DOCUMENTS

- A. The General Conditions and all other Contract Documents for this project are complementary and applicable to this section of the Specifications.

1.02 SCOPE OF WORK

- A. Work Included
 - 1. Coating/lining of concrete wet wells as indicated on the contract drawings.
 - 2. Coating/lining of concrete sanitary sewer storage vault at Station W as indicated on the contract drawings.
- B. Related Work Specified Elsewhere
 - 1. Section 03300 – Cast In Place Concrete
 - 2. Section 09800 – Coating Systems

1.03 SUBMITTALS

- A. The Contractor shall furnish detailed data pertaining to the surfaces of the structure(s) to be rehabilitated, the rehabilitation product, surface preparation and installation for review. At the request of the Engineer, Contractor shall test for adverse chemical conditions that may hinder product performance.
- B. Prior to installation, Contractor shall submit technical data demonstrating conformance with these specifications. Contractor shall submit certificate of compliance prior to installation.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Lining material furnished under this specification shall be a prepackaged two-part system using an epoxy base coat and a high build polyurethane elastomer top coat.
- B. The physical properties of the lining system shall be as tabulated below:

	Epoxy	Polyurethane
Type:	Modified Amine	Aromatic
Components:	2	2

Color:	Purple	Tan
Application:	Plural Spray	Plural Spray
Mixing Ratio:	2:1	2:1
Pot Life:	15 minutes	30 seconds
Standard Thickness:	2-5 mils	60-125 mils
Minimum Cure Time:	4 hrs @ 70° F	4 hrs @ 70° F
Recoating Time:	2 hrs @ 70° F	30 min @ 70° F
Combined Weight:	9.6 lb/gal	10.8 lb/gal
Thinning:	None	None

C. Lining shall be Sancon 100 Epoxy/Urethane Coating System or approved equal.

PART 3 EXECUTION

3.01 GENERAL

- A. All materials shall be delivered to the site in the manufacturer's sealed containers. Each container shall be labeled by the manufacturer, and the label shall be intact upon delivery. Materials shall not be delivered until the Engineer's written approval has been received.
- B. Installation shall be in conformance with the manufacturer's recommendations unless otherwise noted herein.
- C. Care shall be exercised not to damage adjacent work during surface preparations.

3.02 SURFACE PREPARATION

- A. Ensure sub-surfaces are clean and free of laitance, loose material, residue and all existing coating and lining materials.
- B. Deteriorated concrete surfaces shall be cleaned by high pressure water to sound concrete.

3.03 APPLICATION OF MATERIALS

- A. Coating shall be applied by a Manufacturer approved installer
- B. Coating shall be applied by spray methods in accordance with the manufacturer requirements.

END OF SECTION

**SECTION 11320
SUBMERSIBLE PUMPS**

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Requirements for provision of pump systems including rail-mounted pumps and motors for duty service with municipal wastewater. For Lift Station J, a total of two (2) pumps shall be provided and installed as indicated on the Drawings. For Lift Station W, a total of three (3) pumps shall be provided, with two (2) of those pumps installed as indicated in the Drawings and a third pump provided to the City as a spare. This section also includes the provisions for salvaging one of the existing pumps at Lift Station J to the City Utilities Department.
- B. Related Sections:
 - 1. Section 01330 - Submittal Procedures.
 - 2. Section 01600 - Product Requirements.
 - 3. Section 15050 - Basic Mechanical Materials and Methods.

1.02 REFERENCES

- A. American Bearing Manufacturers Association (ABMA):
 - 1. 9 - Load Ratings and Fatigue Life for Ball Bearings.
 - 2. 11 - Load Ratings and Fatigue Life for Roller Bearings.
- B. American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME):
 - 1. B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.
 - 2. B16.5 - Pipe Flanges and Flanged Fittings.
- C. American Society for Testing and Materials (ASTM):
 - 1. A 48 - Standard Specification for Gray Iron Castings.
 - 2. A 108 - Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality.
 - 3. A 167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - 4. A 176 - Standard Specification for Stainless and Heat-Resisting Chromium Steel Plate, Sheet and Strip.
 - 5. A 276 - Specification for Stainless Steel Bars and Shapes.
 - 6. A 283 - Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.

7. A 532 - Specification for Abrasion-Resistant Cast Irons.
 8. A 576 - Specification for Steel Bars, Carbon, Hot Wrought, Special Quality.
 9. A 582 - Specification for Free-Machining Stainless and Heat-Resisting Steel Bars.
 10. A 743 - Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion-Resistant, for General Application.
 11. B 148 - Specification for Aluminum-Bronze Sand Castings.
 12. B 505 - Specification for Copper-Base Alloy Continuous Castings.
 13. B 584 - Specification for Copper Alloy Sand Castings for General Applications.
 14. E 10 - Test Method for Brinell Hardness of Metallic Materials.
 15. E 18 - Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials.
 16. F 593 - Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
 17. F 594 - Specification for Stainless Steel Nuts.
- D. American National Standards Institute/Hydraulic Institute (ANSI/HI):
1. 1.1-1.5 - Centrifugal Pumps - Nomenclature, Definitions, Application and Operation.
 2. 1.6 - Centrifugal Pump Tests.
 3. 9.1-9.5 - General Pump Standards For Types, Definitions, Application, And Sound Measurements.

1.03 DEFINITIONS

- A. Pump head (Total Dynamic Head, TDH), flow capacity, pump efficiency, net positive suction head available (NPSHa), and net positive suction head required (NPSHr): As defined in ANSI/HI 1.1-1.5, 1.6 and 9.1-9.5 and as modified in the Specifications.
- B. Suction Head: Gauge pressure available at pump intake flange or bell in feet of fluid above atmospheric; average when using multiple suction pressure taps, regardless of variation in individual taps.
- C. Tolerances: As defined in ANSI/HI 1.6 and 2.6, or more restrictive tolerances specified herein.

1.04 SYSTEM DESCRIPTION

- A. Submersible Pumps with Components: Submersible pumps, motor drivers, bearings, seals, supports, electrical cable, necessary controls and instrumentation, taps, lifting eyes, lifting cable or chain and guide rails, guide rail supports, self aligning discharge connection, mounting pedestal and similar type items as specified and similar type items as specified and as required for

complete operational units ready for use as specified and installed as indicated on the Drawings.

B. Pump Types: Pumps supplied and installed under this sections shall be heavy duty, submersible type pumps having the general characteristics as tabulated:

1. Lift Station J, Flygt Model NP 3127 HT – Adaptive Hard Iron 487 (Two Pumps)

a.	Design Capacity per Pump (gpm)	153
b.	Rated Total Pump Head at Design (feet)	84
c.	Maximum Rotative Speed (rpm)	1,720
d.	Shutoff Head (feet)	103
e.	Minimum Pump Efficiency (at rated point)	43
f.	Motor Horse Power	10
g.	Motor Voltage (3 phase)	230
h.	Discharge Size (inches)	4
i.	Pump Curve:	

	0 gpm	103 ft
	50 gpm	99 ft
	100 gpm	94 ft
	150 gpm	89 ft
Rated Point	177 gpm	87 ft
	200 gpm	85 ft
	250 gpm	81 ft
	300 gpm	78 ft
	350 gpm	74 ft
	400 gpm	71 ft
	500 gpm	64 ft
	600 gpm	57 ft
	700 gpm	50 ft
	800 gpm	43 ft
	900 gpm	36 ft

2. Lift Station W, Flygt Model NP 3102 MT – Adaptive Hard Iron 463 (Three Total Pumps)

a.	Design Capacity per Pump (gpm)	500
b.	Rated Total Pump Head at Design (feet)	25
c.	Maximum Rotative Speed (rpm)	1,745
d.	Shutoff Head (feet)	52
e.	Minimum Pump Efficiency (at rated point)	70
f.	Motor Horse Power	5
g.	Motor Voltage (3 phase)	230
h.	Discharge Size (inches)	4
i.	Pump Curve:	

	0 gpm	52 ft
	50 gpm	48 ft
	100 gpm	45 ft
	150 gpm	42 ft
	200 gpm	39 ft
	250 gpm	37 ft
	300 gpm	34 ft
	350 gpm	32 ft

	400 gpm	30 ft
	450 gpm	27 ft
Rated Point	500 gpm	25 ft
	550 gpm	22 ft
	600 gpm	20 ft
	650 gpm	17 ft
	700 gpm	14 ft
	750 gpm	11 ft
	800 gpm	9 ft
	837 gpm	7 ft

1.05 SALVAGING EXISTING PUMP

- A. One of the existing pumps at Lift Station J shall be salvaged and used by the City as a spare pump. Contractor shall deliver both pumps at Lift Station J to a Flygt Certified Repair Facility. At the facility, both pumps shall be inspected, and the pump determined to be in the best condition shall have Flygt's Certified Preventative Maintenance performed to ensure the pump's reliability as a spare. Any recommended repairs will be quoted directly to the City, and any repairs will be paid directly by the City.

1.06 SUBMITTALS

- A. The manufacturer shall submit to the Engineer for approval, certified performance curves and shop and assembly drawings. The drawings shall show the dimensions, ratings, component parts, arrangements, and materials of construction for all items covered under this section. The performance curves shall be based on data secured during actual tests run at the factory on the pump model proposed for installation, and signed by a responsible manufacturer's representative. The curves shall show the make, model, size, and trim of the impeller, the developed head, brake horse power, NPSH, and efficiency at intervals of 100 gpm in capacity for the model operating at the specified rotative speed over the operating range of the pump.
- B. Manufacturer shall supply six (6) sets of its standard submittals which shall contain the following:
1. Pump Outline Drawings
 2. Enclosure Tube Fabrication Drawings
 3. Fabrication Drawings for Mounting Pedestal
 4. Motor Performance Data
 5. Cable and Protective Device Data
 6. Typical Installation Guides
 7. Certified Pump Performance Curves
 8. Detailed Description and Dimensions of All Accessories
 9. Detailed Electrical Data
 10. Control Drawings and Data

11. Technical Manuals
12. Parts Lists
13. Printed Warranty
14. Certificates from the Contractor and equipment suppliers that they have properly coordinated the pump motors with the Motor Control Center (MCC) supplier and the motors and MCC are mutually compatible.

1.07 QUALITY ASSURANCE

- A. **General:** Pumps shall be suitable for pumping municipal wastewater and shall be designed and fully guaranteed for this use. Motors supplied with submersible pumps under this specification shall be suitable for continuous operation under submerged, partially submerged or dry conditions. Motors shall be non-overloading throughout the full range of pump operation, as established by their corresponding pump model performance curve. (For Lift Station J, the motors need not be non-overloading throughout the entire performance curve. For Lift Station J, the motors shall be non-overloading from 0 to 400 gpm as established by their corresponding pump model performance curve.)
- B. **Standards:** Equipment furnished and installed by the contractor shall be in full conformity and harmony with the intent to secure the best standard of construction and equipment as a whole or in part. Pumps shall be installed in strict accordance with the manufacturer's standard drawings and their installation instructions.
- C. **Manufacturer:** The pump equipment specified herein shall be the design and fabrication of a single manufacturer which shall have sole source responsibility for said equipment. The manufacturer shall have electric submersible equipment of this design and of comparable capacity in successful operation for a minimum of 15 years. References and records of experiences shall be provided if requested by the Engineer.
- D. **Submittals:** Submittal data provided shall be of sufficient depth to illustrate compliance with these specifications, the plans and other specifications that may influence the proper operation of this pump. No pump equipment shall be shipped until the required drawings and curves have been submitted to and acknowledged by the Engineer as being of general compliance and conformance with the information in the contract documents.
- E. **Testing:** Model pumps shall be factory tested to determine head versus capacity, efficiencies, and kilowatt draw required for the operating points specified. All tests shall be run in accordance with the latest edition of the American Hydraulic Institute Standards. The actual pumps furnished shall also be tested for:
 1. Impellers, propellers, motor rating and electrical connections tests shall be run for compliance with specification requirements.
 2. Motor and cable insulation test for moisture content or insulation defects shall be performed with a 1,000 volt DC megger.

3. After a submerged test run of 30 minutes under 6 feet of water, Test 2 shall be repeated.
 4. If any deviation of the above tests is found, that pump shall be rejected.
- F. **Operation and Maintenance Manuals:** The pump supplier shall provide operation and maintenance manuals for all equipment and accessories furnished. The manuals shall be original (no photocopies) and contain at least the following:
1. Identification stating the general nature of the manual, which appears on or is readable through the front cover.
 2. Neatly typewritten index near the front of the manual, furnishing immediate information as to location in the manual of all emergency data regarding the equipment.
 3. Complete and detailed instructions regarding operation and maintenance of all equipment involved.
 4. Complete nomenclature of all replaceable parts, their part numbers, current cost, list of recommended spare parts to be kept on hand, and name, address and telephone number of nearest vendor of parts.
 5. Copies of all guaranties and warranties issued.
 6. Copies of the favorably reviewed shop drawings with all data concerning changes made during construction.
 7. Where content of manuals includes manufacturers' catalog pages, clearly indicate the precise items included in this installation.
- G. **Guarantee:** The pump manufacturer shall warrant the units being supplied to the CITY against defects in workmanship and material for a period of five (5) years or 10,000 hours, whichever shall occur first.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. As specified in Section 15050.

1.09 PROJECT CONDITIONS

- A. Environmental Requirements: As specified in Section 15050.
- B. Install pumps as indicated on the drawings.

1.10 SEQUENCING AND SCHEDULING

- A. Coordinate with restrictions as specified in Section 01140.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Pumps shall be furnished by a single manufacturer.

2.02 RAIL-MOUNTED SUBMERSIBLE PUMP AND MOTOR

- A. Pump shall be designed for municipal wastewater and shall pass a two-inch spherical solid without clogging. Pump characteristics shall be such that the motor nameplate rating is not exceeded at any point on the operating curve.
- B. Pumps for Station J shall be Flygt Model NP 3127 Type HT 3 – 487 Adaptive Hard Iron Impeller (10 hp) or equal with a 4-inch quick disconnect discharge suitable for rail-mounted submerged installation. Pump and motor shall be explosion-proof (X Designation). Pumps for Station W shall be Flygt Model NP 3102 Type MT 3 – 463 Adaptive Hard Iron Impeller (5 hp) or equal with a 4-inch quick disconnect discharge suitable for rail-mounted submerged installation. Pump and motor shall be explosion-proof (X Designation). Only those manufacturers and products that meet these specifications may be considered equal.
- C. The pump shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the station to the discharge connection as detailed on the Drawings. There shall be no need for personnel to enter the wet well to remove the pump for service.
 - 1. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact.
 - a. Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable.
 - 2. No portion of the pump shall bear directly on the sump floor.
- D. Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be of stainless steel construction. All metal surfaces coming into contact with the liquid pumped, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.
- E. Sealing design shall incorporate **metal-to-metal contact** between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.
 - 1. Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal.
 - 2. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.
- F. Motors shall be designed to be sufficiently cooled by the surrounding environment or pumped media.
- G. The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of dual cylindrical elastomer grommets, flanked by washers, all having a close tolerance

fit against the cable outside diameter and the entry inside diameter. The grommets shall be compressed by the cable entry unit, thus providing a strain relief function. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry junction chamber and motor shall be sealed from each other, which shall isolate the stator housing from foreign material gaining access through the pump top.

1. Epoxies, silicones, or other secondary sealing systems shall not be considered equal.
- H. The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber.
1. Stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31. The stator shall be heat-shrink fitted into the cast iron stator housing.
 - a. The use of multiple step dip and bake-type stator insulation process is not acceptable.
 - b. The use of pins, bolts, screws or other fastening devices used to locate or hold the stator and that penetrate the stator housing are not acceptable.
 2. The motor shall be designed for continuous duty while handling pumped media of up to 104°F.
 3. The motor shall be capable of withstanding at least 30 evenly spaced starts per hour. Data verifying this capability shall be submitted.
 4. The rotor bars and short circuit rings shall be made of aluminum.
 5. Three thermal switches shall be embedded in the stator end coils, one per phase winding, to monitor the stator temperature. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the motor control panel.
 6. The junction chamber shall be sealed off from the stator housing and shall contain a terminal board for connection of power and pilot sensor cables using threaded compression type terminals.
 7. The motor service factor (combined effect of voltage, frequency and specific gravity) shall be 1.15. The motor shall have a voltage tolerance of +/- 10%. The motor shall be designed for continuous operation in up to a 40°C ambient and shall have a NEMA Class B maximum operating temperature rise of 80° C. A motor performance chart shall be provided upon request exhibiting curves for motor torque, current, power factor, input/output kW and efficiency. The chart shall also include data on motor starting and no-load characteristics.
 8. Motor horsepower shall be sufficient so that the pump is non-overloading throughout its entire performance curve, from shut-off to run-out. (See Section 1.06.A for the exception for Lift Station J.) The motor and cable

shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.

- I. The integral pump/motor shaft shall rotate on two bearings. The motor bearings shall be sealed and permanently grease lubricated with high temperature grease. The upper motor bearing shall be a two row angular contact ball bearing. The lower bearing shall be a two row angular contact ball bearing to handle the thrust and radial forces. The minimum L10 bearing life shall be 50,000 hours at any usable portion of the pump curve.
- J. Each pump shall be provided with a positively driven dual, tandem mechanical shaft seal system consisting of two seal sets, each having an independent spring. The lower primary seal, located between the pump and seal chamber, shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide ring. The upper secondary seal, located between the seal chamber and the seal inspection chamber, shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide seal ring. All seal rings shall be individual solid sintered rings. Each seal interface shall be held in place by its own spring system. The seals shall not depend upon direction of rotation for sealing.
 1. Mounting of the lower seal on the impeller hub is not acceptable.
 2. Shaft seals without positively driven rotating members or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces are not acceptable.
 3. The seal springs shall be isolated from the pumped media to prevent materials from packing around them, limiting their performance.
 4. Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and shall provide capacity for lubricant expansion. The seal lubricant chamber shall have one drain and one inspection plug that are accessible from the exterior of the motor unit.
 5. The seal system shall not rely upon the pumped media for lubrication.
 6. The area about the exterior of the lower mechanical seal in the cast iron housing shall have cast in an integral concentric spiral groove. This groove shall protect the seals by causing abrasive particulate entering the seal cavity to be forced out away from the seal due to centrifugal action.
 7. A separate seal leakage chamber shall be provided so that any leakage that may occur past the upper, secondary mechanical seal will be captured prior to entry into the motor stator housing. Such seal leakage shall not contaminate the motor lower bearing. The leakage chamber shall be equipped with a float type switch that will signal if the chamber should reach 50% capacity.
- K. The pump and motor shaft shall be a single piece unit. The pump shaft shall be an extension of the motor shaft.
 1. The shaft shall be stainless steel – ASTM A479 S43100-T.
 2. Shaft sleeves will not be acceptable.

3. Shafts using mechanical couplings shall not be acceptable.
- L. The impeller shall be of Hard Iron (high chrome gray cast iron, ASTM A-532, Alloy III A, 25% chrome cast iron), dynamically balanced, semi-open, multi-vane, back swept, screw-shaped, non-clog design. Brush or spray-on coatings are not acceptable. The impeller leading edges shall be mechanically self-cleaned automatically upon each rotation as they pass across a spiral groove located on the volute suction. The screw-shaped leading edges of the impeller shall be hardened to Rc 60 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater. The impeller shall be capable of momentarily moving axially upwards a distance of 0.6 inch to allow larger debris to pass through and immediately return to the normal operating position.
1. The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 5% sludge and rag-laden wastewater.
 2. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw.
 3. The Impeller shall be locked to the shaft and held by an impeller bolt.
 4. The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 5% sludge and rag-laden wastewater.
- M. The pump volute shall be a single piece gray cast iron, ASTM A-48, Class 35B, non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified.
1. The volute shall have integral spiral-shaped, sharp-edged groove(s) that is cast into the suction cover. The spiral groove(s) shall provide the sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed.
 2. The volute shall have a replaceable suction cover insert ring in which are cast spiral-shaped, sharp-edged groove(s). The spiral groove(s) shall provide trash release pathways and sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. The insert ring shall be cast of Hard Iron (high chrome gray cast iron, ASTM A-532, Alloy III A, 25% chrome cast iron) and provide effective sealing between the multi-vane semi-open impeller and the volute housing.
 3. The internal volute bottom shall provide effective sealing between the multi-vane semi-open impeller and the volute.
- N. Each pump motor stator shall incorporate three thermal switches, one per stator phase winding and be connected in series, to monitor the temperature of the motor. Should the thermal switches open, the motor shall stop and activate an alarm. A float switch shall be installed in the seal leakage chamber and will activate if leakage into the chamber reaches 50% chamber capacity, signaling the need to schedule an inspection.

1. The thermal switches and float switch shall be connected to a control and status monitoring unit designed to be mounted in the pump control panel.
- O. **Coatings:** Pump volutes and discharge connections shall be fusion bonded epoxy coated at the factory. Motors shall be coated with a coal-tar epoxy at the factor. Coatings shall be in compliance with applicable AWWA standards.
- P. **Nameplates:** Motors shall have a stainless steel plate showing the motor connection diagram and a stainless steel nameplate indicating type, frame, insulation class, full load current, horsepower, full load minimum guaranteed efficiency and nominal power factor, rpm, degree rise in Celsius, maximum ambient temperature rating in degrees Celsius, manufacturer's name, serial number, model, voltages, locked motor Kva code and bearing numbers.

2.03 SUPPORT BASE AND DISCHARGE ELBOW

- A. Provide quick-disconnect ductile iron discharge elbow for the rail-mounted submersible pump, suitable for installation as shown on the Drawings.
- B. Discharge elbow shall be specifically matched to the pump model by the manufacturer.
- C. The entire weight of the pump/motor shall be supported by the pump support base.

2.04 ACCESSORIES

- A. Pump accessories shall be furnished by the pump manufacturer and shall be compatible with each of the submersible pumps and the conditions of their installation.
- B. All accessory hardware including rails, anchor bolts and cable brackets shall be Type 316 stainless steel.
- C. Accessories for each submersible pump and motor:
 1. Rail-mounted submersible pump.
 - a. Base pedestal for mounting to concrete foundation as shown.
 - b. At least 20 LF of submersible motor cable (SUBCAB) or as necessary to complete the installation.
 - c. Cable holder.
 - d. Lifting eyes compatible with the pump.
 - e. Dual moisture sensing probe system to detect the entrance of moisture and provide an alarm. The moisture detection system shall be designed to detect the entrance of moisture in the high heat transfer fluid reservoir and the air-filled motor stator housing.
 - f. A316 stainless steel rails, mounting hardware and anchor bolts as called for on the drawings or fabrication drawings and any other miscellaneous supplies required to complete the installation.

2.05 COATINGS

- A. Equipment shall receive final finish coats at the factory. Each coat of paint shall be of the consistency as supplied by the paint manufacturer, or thinned if necessary, and applied in accordance with the manufacturer's written instructions. Work shall be free from "runs", "bridges", "shiners", or other imperfections. Care shall be taken to obtain a uniform, unbroken coating over welds, edges and corners. Weld splatter shall be removed and all welds neutralized with thinner. Blasted surfaces shall be coated within four hours of being sandblasted. All dust shall be removed from surfaces prior to coating.
- B. All surfaces to be coated or painted shall be in the specified condition to receive the material before any coating or painting is performed. Follow manufacturer's instructions. During and after final application of protective coatings, all metal surfaces shall be checked mechanically with an Elcometer, Mikrotest, or other approved dry film thickness gage to insure that the specified dry film thickness has been attained. Coating testing and repair of damages, flawed areas, holidays, or mishaps shall conform to applicable AWWA standards.
- C. Care shall be taken to prevent damage to coated surfaces during shipment. Any coatings damaged during shipment shall be refinished as the original at no extra cost to the City.
- D. Coatings shall be guaranteed for a period of one year following the date of final acceptance.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Pumps shall be installed in strict accordance with the approved procedures shown on the manufacturer's shop and assembly drawings, specifications and their instructions.
- B. Anchor bolts and grout pads for the pump pedestal shall be drilled and epoxied into place per Section 03300 after the pump and discharge piping are set.

3.02 FIELD QUALITY CONTROL

- A. Witnessing: All field testing shall be witnessed by the Engineer; provide advanced notice of field testing.
- B. Inspection and Check-out: As specified in Section 15050.
- C. Equipment Performance Test: Test pump operations using automatic level controls as scheduled with the CITY and described herein.
- D. Operational Testing:
 - 1. After installation, equipment shall be tested in the presence of the Engineer by an authorized pump manufacturer representative who shall certify, in

writing, that the pumps are operating in compliance with these specifications and are free from binding, scraping, overloading, vibration or other defects.

2. Each pumping unit shall be run and monitored as field conditions allow. Motor running current readings shall be taken for each phase. Coordinate testing with the City.
3. The manufacturer's representative shall perform the following:
 - a. Check motor stator and power cables.
 - b. Check seal lubrication.
 - c. Check for proper rotation.
 - d. Check power supply voltage.
 - e. Measure motor operating load and no load current for each phase.
 - f. Check level control operation and sequence.

3.03 MANUFACTURER'S FIELD SERVICES

- A. Require manufacturer to inspect system before initial start-up and certify that system has been correctly installed and prepared for start-up as specified in this section and Section 15050.

END OF SECTION

**SECTION 13120
PRE-ENGINEERED CANOPY**

PART 1 GENERAL

1.01 SUMMARY

- A. Design, fabricate, and erect a pre-engineered, pre-fabricated steel canopy as shown on the Drawings. It is the intent of this specification to establish a quality and performance level for architectural and structural design, material, durability, and workmanship for a metal canopy complete as shown on the drawings and specified herein.

1.02 DOCUMENTS

- A. The General Conditions and all other Contract Documents for this project are complementary and applicable to this section of the Specifications.

1.03 QUALITY ASSURANCE

- A. The canopy shall be designed by a manufacturer who is regularly engaged in the manufacture of pre-fabricated metal structures. All material shall be new and free from defects. The following standards and criteria (of most recent issue) shall be used where applicable in the structural design and detailing of the canopy.
1. Metal Building Manufacturer's Association (MBMA), Metal Building Systems Manual
 2. American Institute of Steel Construction (AISC), Steel Construction Manual
 3. American Welding Society (AWS), Structural Welding Code

1.04 REFERENCE STANDARDS

- A. Standards listed below are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of listed standards, the requirements of this section shall prevail. Where two or more standards are at variance, the most restrictive requirement shall apply.
1. California Building Code, latest edition.
 2. ASTM Standards.
 3. Underwriter's Laboratories, Inc.
 4. Factory Mutual Association.

1.05 SUBMITTALS

- A. Submit shop drawings for approval. Contractor submittals shall:

1. Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
 2. Include erection drawings, elevations, and details where applicable.
 3. Include welding details.
- B. Quality Control Submittals:
1. Design Data. Submit structural and anchorage calculations demonstrating conformance with state and local building code requirements.
- C. Sufficient information shall be submitted to demonstrate compliance of the Contractor's proposed canopy with the Drawings and Specifications. All drawings, specifications and calculations shall bear the seal and signature of a civil or structural engineer currently registered in California, and shall be of sufficient clarity to obtain City approval. No work shall commence until the above documents have been reviewed by the Engineer.
- D. Review by the Engineer or by the City does not relieve the Contractor from his obligation to meet the requirements of these specifications and applicable building codes.

1.06 DESIGN REQUIREMENTS

- A. The installation of fabricated metal work shall conform to the 2016 California Building Code (CBC).
- B. All loads, including lateral loads, and load combinations shall be in accordance with the CBC. Design shall include wind and seismic loads.
- C. Canopy shall be designed to provide lateral support of antenna pole shown on the Drawings.

PART 2 PRODUCTS

2.01 FRAMING

- A. The pre-fabricated metal canopy shall be a steel clear span rigid frame and braced structure with steel sub-framing and roof sheets. Canopy shall be supported on two columns as shown in the Drawings. Roof slope shall not be less than ½-inch per foot. The dimensions shall be as shown on the Drawing.
- B. Framing, including columns, shall be composed of structural steel tubing.
- C. Tubing shall be structural steel Hollow Structural Sections (HSS) of rectangular or square cross-section conforming to either ASTM Specification A500 or A1085.
- D. Framing members shall have welded connections.

2.02 ANCHORAGE

- A. Anchorage design shall be by the canopy manufacturer. Anchorage calculations shall be included in the structural calculations.
- B. Anchor bolts shall conform to ASTM F1554 with grades as specified by the canopy manufacturer. Hex nuts shall conform to ASTM A563. Washers shall conform to ASTM F436.

2.03 ROOF COVERING AND SUPPORTS

- A. Roof Panels: Exposed metal roof covering shall be either 24-gauge (minimum) aluminum zinc coated steel panels or 24-gauge (minimum) aluminum panels. Roof panels shall be of a ribbed design. Roof panels shall be fastened to the purlins with stainless steel or aluminum weather-sealed type screws, bolts, rivets, or clips. Fasteners shall be adequately spaced to develop code uplift resistance.
- B. Roof panels shall be coated with the manufacturer's standard coating system. Contractor shall submit a color chip to the City for approval.
- C. A one year weather tightness guarantee for roof system installation shall be given to the City, in writing, by the Contractor.
- D. Purlins: Purlin sizing, configuration, and spacing shall be provided as required to meet all design criteria, including deflection, are met or exceeded.

2.04 COATING

- A. Frame shall be supplied with coating system as specified for ferrous metal coatings for non-immersion service in Section 09800 – Coating Systems. Coating shall be tan in color. Contractor shall submit a color chip to the City for approval.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verification of Conditions: Prior to beginning work under this section, examine other work in place to verify that it is satisfactory to receive the work of this Section. If unsatisfactory conditions exist, do not begin this work until such conditions have been corrected.

3.02 DELIVERY AND STORAGE

- A. Materials shall be delivered to the site in a weather protected and undamaged condition, and stored out of contact with the ground. Materials other than framing and structural members shall be covered with weather-tight coverings and kept dry. Storage accommodations for roof covering shall provide good air circulation and protection from surface staining.

3.03 ERECTION

- A. Contractor shall follow the canopy manufacturer's shop drawings and instructions for installation. Base plates, anchor bolts and grout pads shall be provided as detailed on the canopy shop drawings.
- B. Touch-up, repair or replace damaged products.

END OF SECTION

**SECTION 15050
BASIC MECHANICAL MATERIALS AND METHODS**

PART 1 GENERAL**1.01 SUMMARY**

- A. Section Includes: Basic design and performance requirements for mechanical equipment.
- B. Related Sections:
 - 1. Section 01782 – Operating and Maintenance Data
 - 2. Section 09800 – Coating Systems

1.02 REFERENCES

- A. American Society of Mechanical Engineers (ASME):
 - 1. ASME PTC 8.2 - Performance Test Code for Centrifugal Pumps.
 - 2. ANSI/ASME PTC 10 - Performance Test Code - Compressors and Exhausters.
 - 3. ANSI/ASME PTC 17 - Performance Test Code - Reciprocating Internal-Combustion Engines.
 - 4. ANSI/ASME PTC 11 - Performance Test Code - Measurement of Shaft Horsepower - Instruments and Apparatus.
- B. American Bearing Manufacturers Association (ABMA) Standards:
 - 1. ABMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
 - 2. ABMA 11 - Load Ratings and Fatigue Life for Roller Bearings.
- C. American Society for Testing and Materials (ASTM):
 - 1. A 36 - Standard Specification for Structural Steel.
 - 2. A 48 - Standard Specification for Gray Iron Castings.
 - 3. A 526 - Standard Specification for Steel Sheet, Zinc Coated by the Hot Dip Process, Commercial Quality
 - 4. B-61 - Standard Specification for Steam or Valve Bronze Castings.
 - 5. B 62 - Standard specification for Composition Bronze or Ounce Metal Castings.
 - 6. E 527 - Standard Practice for Numbering Alloys and Metals (UNS).
- D. American National Standards Institute/Hydraulic Institute Standards (ANSI/HI):
 - 1. ANSI/HI 1.1-1.5 - Centrifugal Pumps - Nomenclature, Definitions, Application and Operation.

2. ANSI/HI 1.6 - Centrifugal Pump Tests.
3. ANSI/HI 2.1-2.5 - Vertical Pumps - Nomenclature, Definitions, Application and Operation.
4. ANSI/HI 2.6 - Vertical Pump Tests.
5. ANSI/HI 3.1-1.5 - Rotary Pumps - Nomenclature, Definitions, Application and Operation.
6. ANSI/HI 3.6 - Rotary Pump Tests.
7. ANSI/HI 4.1-4.6 - Sealless Rotary Pumps - Nomenclature, Definitions, Application, Operation and Test.
8. ANSI/HI 5.1-1.6 - Sealless Centrifugal Pumps - Nomenclature, Definitions, Application, Operation and Test.
9. ANSI/HI 9.1-9.5 - Pumps - General Guidelines for Types, Definitions, Application and Sound Measurement.

1.03 DEFINITIONS

- A. Special Tools: Tools that have been specifically made for use on unit of equipment for assembly, disassembly, repair, or maintenance.
- B. Resonant Frequency: That frequency at which a small driving force produces an ever-larger vibration if no dampening exists.
- C. Rotational Frequency: The revolutions per unit of time usually expressed as revolutions per minute.
- D. Critical Frequency: Same as resonant frequency for the rotating elements or the installed machine and base.
- E. Peak Vibration Velocity: The root mean square average of the peak velocity of the vibrational movement times the square root of 2 in inches per second.
- F. Rotational Speed: Same as rotational frequency.
- G. Maximum Excitation Frequency: The excitation frequency with the highest vibration velocity of several excitation frequencies that are a function of the design of a particular machine.
- H. Critical Speed: Same as critical frequency.
- I. Free Field Noise Level: Noise measured without any reflective surfaces (an idealized situation); sound pressure levels at 3 feet from the source unless specified otherwise.

1.04 SYSTEM DESCRIPTION

- A. General:
 1. Provisions specified under each technical equipment specification prevail over and supersede conflicting provisions as specified in this Section.

2. Provide equipment and parts that are suitable for stresses which may occur during fabrication, transportation, erection, and operation.
 3. Provide equipment that has not been in service prior to delivery, except as required by tests.
 4. Like parts of duplicate units are to be interchangeable.
 5. When two or more units of equipment for the same purpose are required, provide products of same manufacturer.
 6. Equipment manufacturer's responsibility extends to selection and mounting of gear drive units, motors or other prime movers, accessories, and auxiliaries required for proper operation.
 7. When necessary, modify manufacturer's standard product to conform to specified requirements or requirements indicated on the Drawings and contained in laws and regulations.
- B. Material Requirements:
1. Materials: Suitable for superior corrosion resistance and for services under conditions normally encountered in similar installations.
 2. Dissimilar Metals: Separate contacting surfaces with dielectric material.
- C. Power Transmission Systems:
1. Power Transmission Equipment: Rated for 24 hour-a-day continuous service or frequent stops-and-starts intermittent service, whichever is most severe, and sized with a minimum service factor of 1.5.
 - a. Apply 1.5 service factor to nameplate horsepower and torque of prime source of power and not to actual equipment loading.
 - b. Apply service factors higher than 1.5 when recommended for continuous 24 hour-per-day operation and shock loadings specified in AGMA 6010-E88, other applicable AGMA standards, or other applicable referenced standards.
 - c. When manufacturer recommends service factor greater than 1.5, manufacturer's recommendation takes precedence.
- D. Vibration:
1. Resonant Frequency: Ensure there are no natural resonant torsional, radial, or axial frequencies within 25 percent above or below the operating rotational frequencies or multiples of the operating rotational frequencies that may be excited by the equipment design.
- E. Equipment Mounting and Anchoring:
1. Mount equipment on cast iron or welded steel bases with structural steel support frames. Utilize continuous welds to seal seams and contact edges between steel members. Grind welds smooth.

2. Provide bases and supports with machined support pads, dowels for alignment or mating of adjacent items, adequate openings to facilitate grouting, and openings for electrical conduits.
 3. Provide jacking screws in bases and supports for equipment weighing over 1,000 pounds.
 4. Anchor equipment base to concrete pad. Determine number, size, type, and location of bolts, anchor bolts, or other connections.
 5. Provide bolt sleeves for anchor bolts for heavy equipment. Adjust bolts to final location and fill sleeve with non-shrink grout.
- F. Structural Design:
1. For equipment with operating weight of 400 pounds or more provide calculations for:
 - a. Determination of operating weight and centroid of equipment.
 - 1) Operating weight is to be weight of unit plus weight of fluids or solids normally contained in unit during operation.
 - b. Determination of seismic forces and overturning moments.
 - c. Determination of shear and tension forces in connections.
 - d. Design of connection details based on calculated shear and tension forces.
- G. Equipment Units Weighing 50 Pounds or More: Provide with lifting lugs or eyes to allow removal with hoist or other lifting device.

1.05 SUBMITTALS

- A. Product Data:
1. For each item of Equipment:
 - a. Design features.
 - b. Load capacities.
 - c. Efficiency ratings.
 - d. Material designations by UNS alloy number or ASTM Specification and Grade.
 - e. Data needed to verify compliance with the Specifications.
 - f. Catalog data.
 - g. Name plate data.
 - h. Clearly mark submittal information to show specific items, materials and accessories or options being furnished.
- B. Shop Drawings:
1. Drawings for Equipment:

- a. Drawings that include outline drawings, cut-away drawings, parts lists, material specification lists, and other information required to substantiate that proposed equipment complies with specified requirements.
 2. Outline drawings showing equipment, driver, driven equipment, pumps, seal, motor(s) or other specified drivers, shafting, U-joints, couplings, drive arrangement, gears, baseplate or support dimensions, anchor bolt sizes and locations, bearings, and other furnished components.
 3. Installation and checkout instructions including leveling and alignment tolerances, grouting, lubrication requirements, and initial start-up procedures.
 4. Wiring, control schematics, control logic diagrams and ladder logic or similar for computer based controls.
 5. Recommended or normal operating parameters such as temperatures and pressures.
 6. Alarm and shutdown set points for all controls furnished.
- C. Calculations:
1. Calculations and other information to substantiate base plates, supports, and anchor bolts meet minimum design strength requirements and seismic design criteria required by current code.
 2. Bearing L_{10} life calculations in accordance with ABMA 9 or ABMA 11 calculation methods for drivers, pumps, gears, shafts, motors, and other drive line components with bearings.
 3. Calculations and other information to substantiate that operating rotational frequencies meet the requirements of this Section.
 4. Torsional Analysis of Power Transmission Systems: When torsional analysis specified in the equipment Sections, provide:
 - a. Sketch of system components identifying physical characteristics including mass, diameter, thickness, and stiffness.
 - b. Results of analysis including first and second critical frequencies of system components and complete system.
 5. Calculations for connection details demonstrating compliance with specified structural design requirements.
 6. Require Professional Engineer registered in state where Project is located to stamp and sign calculations.
- D. Quality Control Submittals:
1. Source quality control reports and certified test data.
 2. Submit factory test reports before shipment.
 3. Certified static and dynamic balancing reports for rotating equipment.
 4. Field quality control reports and test data.

5. Start-up Plan: Proposed plan for field-testing equipment as specified in Section 01756.
 6. Certificate of Proper Installation: As specified in Section 01756.
 7. Submit material test reports as specified in the equipment sections.
- E. Operation and Maintenance Manuals:
1. As specified in Section 01782.
 2. Submit prior to training of CITY's personnel.
 3. Make available at project site complete copy of manuals for use by field personnel and ENGINEER during start-up and testing of equipment.
 4. Include manufacturer and model number of every bearing; include calculated ball pass frequencies of the installed equipment for both the inner and outer raceways.
 5. Include motor rotor bar pass frequencies.

1.06 QUALITY ASSURANCE

- A. Qualifications: Equipment manufacturer and system component manufacturers to have a minimum of 5 years experience in the design, manufacture, and assembly of the specified equipment and components with an established record of successful operation of such equipment and components.
- B. References: Provide references from a minimum of 3 installations currently operating the same model equipment in continuous service for a minimum of 2 years under similar operating conditions. Reference information shall include location, service, contact person, and contact phone number.
- C. Manufacturer's Field Service:
1. Furnish services of authorized representative specially trained in installation of equipment.
 - a. Visit project site and perform tasks necessary to certify installation.
 - b. Furnish Certificate of Proper Installation as specified in Section 01756.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Packing and Shipping:
1. Equipment: Pack in boxes, crates, or otherwise protect from damage and moisture, dust, or dirt during shipment, handling, and storage.
 2. Bearings: Separately pack or otherwise suitably protect during transport.
 3. Spare Parts: Deliver in boxes labeled with contents, equipment to which spare parts belong, and name of CONTRACTOR.
- B. Storage:

1. Equipment Having Bearings: Store in enclosed facilities. Rotate units at least once per month or more often as recommended by the manufacture to protect rotating elements and bearings.
 2. Gear Boxes: Oil filled or sprayed with rust preventive protective coating.
- C. Protection:
1. Equipment: Protect equipment from deleterious exposure.
 2. Painted Surfaces: Protect against impact, abrasion, discoloration, and other damage.

1.08 PROJECT CONDITIONS

- A. Environmental Requirements:
1. Equipment for project is to be suitable for performance in a wastewater pumping plant environment and under following conditions:
 - a. Ambient Temperatures: freezing to 95 degrees Fahrenheit.
 - b. Relative Humidities: 60 to 100 percent.
 - c. Site Elevation: About 10 feet above mean sea level.
 - d. Other: Coastal fog.

1.09 SEQUENCING AND SCHEDULING

- A. Equipment Anchoring: Obtain from equipment manufacturers' anchoring material and templates or setting drawings in time for anchors to be cast-in-place when concrete is placed.
- B. Coordinate details of equipment with other related parts of the Work, including verification that structures, piping, wiring, and equipment components are compatible.
- C. General Start-up and Testing of Equipment:
1. Perform general start-up and testing procedures after operation and maintenance manuals for equipment have been received.
 2. Conduct functional testing of mechanical or electrical systems when each system is substantially complete and after general start-up and testing procedures have been successfully completed.

1.10 WARRANTY

- A. Warranty: Where no specific term of warranty is provided in a technical specification, warrant equipment free of defects in material and workmanship for one year from the date of acceptance or date of first beneficial use of the equipment by the City; cover parts and labor.
- B. Where a warranty exceeds one year, manufacturer's warranty shall be issued in the City's name.

1.11 MAINTENANCE

- A. Special Tools:
 - 1. When specified, provide special tools required for operation and maintenance.
 - 2. Mark or tag and list such tools in maintenance and operations instructions. Describe use of each tool.
- B. Spare Parts:
 - 1. Assume responsibility until turned over to City.
 - 2. Store in enclosed facilities.
 - 3. Furnish itemized list and match identification tag attached to every part.
 - 4. List parts by generic title and identification number.
 - 5. Furnish name, address, and telephone number of supplier and spare parts warehouse.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Ferrous Materials:
 - 1. Steel for Members used in Fabrication of Assemblies: ASTM A 36.
 - 2. Iron Castings: ASTM A 48, tough, close-grained gray iron, free from blowholes, flaws, and other imperfections.
 - 3. Galvanized Steel Sheet: ASTM A 526, minimum 0.0635 inch (16 gauge).
 - 4. Expanded Metal: ASTM A 36, 13 gauge, 1/2 inch flat pattern expanded metal.
- B. Nonferrous Materials:
 - 1. Stainless Steel: Type 304 or 316 as specified; provide L grade where welding required.
 - 2. Bronze in Contact with Liquid: Composition of not more than 2 percent aluminum nor more than 6 percent zinc; UNS Alloy C83600, C92200 or C92700 in accordance with ASTM B 62, B-61, B-505, or B-584, when not specified otherwise.
- C. Dielectric Materials for Separation of Dissimilar Metals:
 - 1. Neoprene, bituminous impregnated felt, heavy bituminous coatings, nonmetallic separators or washers, or other materials.

2.02 BEARINGS

- A. Type: Oil or grease lubricated, ball or roller antifriction type, of standard manufacture.

- B. Oil Lubricated Bearings: Provide either pressure lubricating system or separate oil reservoir splash type system.
 - 1. Oil Lubrication Systems: Sized to safely absorb heat energy normally generated in bearings under maximum ambient temperature of 15 degree Fahrenheit above the specified maximum ambient temperature specified under article, Project Conditions; provide external cooler when required, air cooled if water cooling source not indicated on the Drawings. Equip with filler pipe and external level gauge.
- C. Grease Lubricated Bearings, Except Those Specified to Be Factory Sealed: Fit with easily accessible grease supply, flush, drain, and relief fittings.
 - 1. Lubrication Lines and Fittings:
 - a. Lines: Minimum 1/4 inch diameter stainless steel tubing.
 - b. Multiple Fitting Assemblies: Mount fittings together in easily accessible location.
 - c. Use standard hydraulic type grease supply fittings.
 - 1) Manufacturers: One of the following or equal:
 - a) Alenite
 - b) Zurk.
- D. Ratings: Rated in accordance with ABMA 9 or ABMA 11 for L₁₀ rating life of not less than 50,000 hours.
 - 1. Higher ratings, when specified in other Sections, supersede preceding requirement.

2.03 WARNING SIGNS

- A. Provide for equipment that starts automatically or remotely.
- B. Material and Size: Rigid Acrylic, 12" x 9" with pre-drilled mounting holes.
- C. Colors: Per OSHA standards for danger and warning signs.
- D. Submit catalog cut sheet for approval.

2.04 FABRICATION

- A. Nameplates:
 - 1. Engraved or stamped on Type 304 stainless steel and fastened to equipment at factory in an accessible and visible location.
 - 2. Indicate Following Information as Applicable:
 - a. Manufacturer's name.
 - b. Equipment model number and serial number.
 - c. Maximum and Normal rotating speed.
 - d. Horsepower.

- e. Rated capacity.
- f. Service class per applicable standards.
- 3. Nameplates for Pumps: Include:
 - a. Rated total dynamic head in feet of fluid.
 - b. Rated flow in gallons per minute.
 - c. Impeller, gear, screw, diaphragm, or piston size.
- B. Bolt Holes in Equipment Support Frames: Do not exceed bolt diameter by more than 25 percent, up to limiting maximum diameter oversize of 1/4 inch.
- C. Shop Finishing:
 - 1. Provide factory and field coating as specified in Section 09800 – Coating Systems. If not specified in Section 09800, provide coating as follows:
 - a. Bases and Support Frames in Contact with Concrete or Other Material: Paint contacting surfaces with minimum of 2 coats of zinc chromate primer before installation or grouting.
 - b. Shop Primer for Steel and Iron Surfaces, Unless Specified Otherwise:
 - 1) Manufacturers: One of the following or equal:
 - a) Ameron, Amercoat 185 Universal Primer.
 - b) Cook, 391-N-167 Barrier Coat.
 - c) Kop-Coat, Pug Primer.
 - d) Tnemec, 37-77 Chem-Prime.
 - e) Valspar, 13-R-28 Chromox Primer.
 - c. Coat machined, polished, and nonferrous surfaces which are not to be painted with rust-preventive compounds.
 - 1) Manufacturers: One of the following or equal:
 - a) Houghton, Rust Veto 344.
 - b) Rust-Oleum, R-9.
 - d. Coating for Ferrous Metal Surfaces, Except Stainless Steel: High solids polyamine epoxy.
 - e. Finish Painting of Motors: Shop finish paint with manufacturer's standard coating.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Inspect all components for shipping damage, conformance to specifications, and proper torques and tightness of fasteners.

3.02 PREPARATION

- A. Metal Work Embedded in Concrete:

1. Accurately place and hold in correct position while concrete is being placed.
 2. Clean surface of metal in contact with concrete immediately before concrete is placed.
- B. Concrete Surfaces Designated to Receive Grout:
1. Give surfaces heavy sandblasting treatment.
 2. Clean surfaces of sandblasting sand, grease, oil, dirt, and other foreign material that may reduce bonding of grout.
 3. Concrete Saturation: Saturate concrete with water. Concrete surface shall be damp concrete at time grout is placed.
- C. Field Measurements:
1. Prior to fabrication of equipment, take measurements for installation of equipment and verify dimensions indicated on the Drawings. Ensure equipment and ancillary appurtenances fit within available space.

3.03 INSTALLATION

- A. Install equipment in accordance with manufacturer's installation instructions and recommendations.
- B. Lubrication Lines and Fittings:
1. Lines from Fittings to Point of Use: Support and protect.
 2. Fittings:
 - a. Bring fittings to outside of equipment in manner such that they are readily accessible from outside without necessity of removing covers, plates, housings, or guards.
 - b. Mount fittings together wherever possible using factory-mounted multiple fitting assemblies securely mounted, parallel with equipment lines, and protected from damage.
 - c. Fittings for Underwater Bearings: Bring fittings above water surface and mount on edge of structure above.
- C. Alignment of Drivers and Equipment:
1. Where drive motors or other drivers are connected to driven equipment by flexible coupling, disconnect coupling halves and align driver and equipment after complete unit has been leveled on its foundation.
 2. Comply with procedures of appropriate Hydraulic Institute Standards, AGMA Standards, alignment tolerances of equipment manufacturers and the following requirements to bring components into angular and parallel alignment:
 - a. Maximum Total Coupling Offset (not the per plane offset): Not to exceed 0.5 mils per inch of coupling length for spacer couplings based on coupling length (not dial separation).

- b. Utilize jacking screws, wedges, or shims as recommended by the equipment manufacturer and as specified in the equipment sections.
 3. Use Reverse-indicator Arrangement Dial Type or Laser Type Alignment Indicators: Mount indicators on the driver/coupling flange and equipment/coupling flange. Alignment instrumentation accuracy to be sufficient to read angular and radial misalignment at 10 percent or less of the manufacturer's recommended acceptable misalignment.
 4. Alignment and calculations to include measurement and allowance for thermal growth, spacer coupling length, indicator separation and axial spacing tolerances of the coupling.
 5. When alignment satisfies most stringent tolerance of system components, tighten anchor bolts and grout between base and foundation. Allow minimum 48 hours for grout to harden. After grout hardens, remove jacking screws, fully tighten anchor bolts, and recheck alignment. Correct alignment as required.
 6. After operational testing is complete, dowel motor or drivers and driven equipment. Comply with manufacturer's instructions.
- D. Grouting Equipment Bases:
 1. Comply with manufacturer's installation instructions for grouting spaces, type of grout, and tolerances for level and alignments, both vertical and horizontal.
 2. Grout base when piping connections are complete and in alignment with no strain transmitted to equipment.
 3. Grout base when equipment is leveled and in alignment.
 4. Place grout, filling voids under equipment bases including recesses between anchor bolts and sleeves.
 - a. Extend grout to edge of bases or bedplates and bevel at 45 degrees around units.
 - b. Finish surfaces with slope that prevents ponding water within grouted areas.
- E. Special Techniques: Use applicable special tools and equipment, including precision machinist levels, dial indicators, and gauges as required in equipment installations.
- F. Tolerances:
 1. Completed Equipment Installations: Comply with requirements for intended use and specified vibration and noise tolerances.
- G. Warning Signs: Mount securely with stainless fasteners at equipment which can be started automatically or from remote locations.

3.04 MANUFACTURER'S REPRESENTATIVE

- A. Field Checkout: Before field testing and start-up, provide services of factory-trained field service representative to certify the equipment has been installed, aligned and checked in accordance with the manufacturers instructions and the Specifications.
- B. Testing: Provide services of factory trained representative to observe and advise the Contractor during field quality control testing.
- C. Training: When training is specified, provide services of factory-trained representative to perform training.

END OF SECTION

**SECTION 15052
BASIC PIPING MATERIALS AND METHODS**

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Basic piping materials and methods.
- B. Related Sections:
 - 1. Section 09800 – Coating Systems
 - 2. Section 15110 – Valves
 - 3. Section 15250 – Pipe and Fittings

1.02 REFERENCES

- A. American Society of Testing and Materials (ASTM):
 - 1. A 53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - 2. A 106 - Specification for Seamless Carbon Steel Pipe for High-Temperature Service.
 - 3. A 312 Standard Specification for Seamless, Straight-seam Welded, and Cold Worked Welded Austenitic Stainless Steel Pipes.
 - 4. D 2240 - Test Method for Rubber Property B Durometer Hardness.
- B. American Water Works Association
 - 1. AWWA C104 - Cement-Mortar Lining for Ductile Iron Pipe and Fittings
 - 2. AWWA C110 - Ductile Iron and Gray Iron Fittings, 3-inch through 48-inch
 - 3. AWWA C111 - Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings
 - 4. AWWA C115 - Flanged Ductile Iron Pipe with Ductile Iron or Gray Iron Threaded Flanges
 - 5. AWWA C116 - Protective Fusion-bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile Iron and Gray Iron Fittings
 - 6. AWWA C151 - Ductile Iron Pipe, Centrifugally Cast
 - 7. AWWA C207 - Steel Pipe Flanges for Waterworks Service
 - 8. AWWA C220 – Stainless-Steel Pipe, 4 In. and Larger

1.03 DEFINITIONS

- A. Aboveground Piping: Piping within buildings, tunnels, or other structures without regard to elevation of piping, or exposed piping outside buildings and structures.
- B. Underground Piping: Piping actually buried in soil or cast in concrete.
- C. Underwater Piping: Piping below tops of walls in basins or concrete tanks containing water.
- D. Wet Wall: Wall with water on at least one side.

1.04 SYSTEM DESCRIPTION

- A. Piping Drawings:
 - 1. Except in details, piping is indicated diagrammatically. Not every offset and fitting, or structural difficulty that may be encountered has been indicated on the Drawings. Sizes and locations are indicated on the Drawings.
 - 2. Perform minor modifications to piping alignment where necessary to avoid structural, mechanical, or other type of obstructions that cannot be removed or changed.
 - a. Modifications are intended to be of minor scope, not involving a change to the design concept or a change to the Contract Price or Contract Times.
- B. Performance Requirements:
 - 1. Restraining Piping:
 - a. Restrain piping at valves and at fittings where piping changes direction, changes sizes, and at ends.
 - 1) When piping is underground, use mechanical restraints.
 - 2) When piping is aboveground or under water, use mechanical or structural restraints.
 - 3) Determine thrust forces by multiplying the nominal cross sectional area of the piping by design test pressure of the piping.
 - b. Provide restraints with ample size to withstand thrust forces resulting from test pressures.
 - 1) During testing, provide suitable temporary restraints where piping does not require permanent restraints.
 - c. Provide underground mechanical restraints where specified in the Piping Schedule or shown on the Drawings.
 - 2. Connections to Existing Piping:
 - a. Expose existing piping to which connections are to be made with sufficient time to permit, where necessary, field adjustments in line, grade, or fittings.

- 1) Protect domestic water supplies from contamination.
 - a) Make connections between domestic water supply and other water systems in accordance with requirements of public health authorities.
 - b) Provide devices approved by City for domestic water supply system to prevent flow from other sources into the domestic supply system.
- b. Make connections to existing piping and valves after sections of new piping to be connected have been tested and found satisfactory.
- c. Provide sleeves, flanges, nipples, couplings, adapters, and other fittings needed to install or attach new fittings to existing piping and to make connections to existing piping.
3. Connections to In-service Piping:
 - a. Where operation and maintenance of existing facilities require that a shutdown be made during hours other than normal working hours, perform the related work in coordination with the hours of actual shutdown.
4. Connections at Dissimilar Metals:
 - a. Connect ferrous and nonferrous metal piping, tubing, and fittings with dielectric couplings especially designed for the prevention of chemical reactions between dissimilar metals.
 - b. Nonferrous metals include aluminum, copper, and copper alloys.
- C. Piping Alternatives:
 1. Provide piping in accordance with this Section, unless indicated on the Drawings or specified otherwise.
 2. Alternative Pipe Ratings: Piping with greater pressure rating than specified may be substituted in lieu of specified piping without changes to the Contract Price. Piping of different material may not be substituted in lieu of specified piping.
 3. Valves in Piping Sections: Capable of withstanding specified test pressures for piping sections and fabricated with ends to fit piping.
 4. For flanged joints, where one of the joining flanges is raised face type, provide a matching raised face type flange for the other joining flange.

PART 2 PRODUCTS

2.01 GASKETS

- A. Gaskets for Steel Piping:
 1. Suitable for pressures equal to and less than 150 pounds per square inch gauge, temperatures equal to and less than 250 degrees Fahrenheit, and raw sewage service.
 2. Gasket Material:

- a. Neoprene elastomer with minimum Shore A hardness value of 70.
 - b. Reinforcement: Inserted 13 ounce nylon fabric cloth for pipes 20 inch or larger.
 - c. Thickness: Minimum 3/32 inch thick for less than 10 inch pipe; minimum 1/8 inch thick for 10 inch and larger pipe.
3. Manufacturers: One of the following or equal:
 - a. Pipe less than 20 inches in Diameter:
 - 1) Garlock, Style 7797.
 - 2) John Crane, similar product.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Existing Conditions:
 1. Pothole to field-locate existing force mains for the connection of new force main.
 2. Locate and expose existing structures, piping, conduits, and other facilities and obstructions that may affect construction of underground piping before starting excavation for new underground piping and appurtenances.
 3. Verify sizes, elevations, locations, and other relevant features of existing facilities and obstructions. Determine conflicts for the construction of the new underground piping and appurtenances.
 4. Make piping location and grade adjustments to resolve conflicts between new piping and existing facilities and obstructions.

3.02 EXPOSED PIPING

- A. Install exposed piping in straight runs parallel to the axes of structures, unless indicated otherwise.
 1. Install piping runs plumb and level, unless otherwise indicated on the Drawings. Slope plumbing drain piping with 1/8 inch per foot downward in the direction of flow.
- B. Install exposed piping after installing equipment and after piping and fitting locations have been determined.
- C. Support piping in accordance with as shown on the contract plans.
 1. Do not transfer pipe loads and strain to equipment.
- D. In addition to the joints indicated on the Drawings, provide unions, flexible couplings, flanged joints, and other types of joints or means which are compatible with and suitable for the piping system, and necessary to allow ready assembly and disassembly of the piping.

- E. Assemble piping without distortion or stresses caused by misalignment.
 - 1. Match and properly orient flanges, unions, flexible couplings, and other connections.
 - 2. Do not subject piping to bending or other undue stresses when fitting piping. Do not correct defective orientation or alignment by distorting flanged joints or subjecting flange bolts to bending or other undue stresses.
 - 3. Flange bolts, union halves, flexible connectors, and other connection elements shall slip freely into place.
 - 4. Alter piping assembly to fit when proper fit is not obtained.
 - 5. Install eccentric reducers or increasers with the top horizontal for pump suction piping.

3.03 BURIED PIPING

- A. Bury piping with minimum 3-foot cover without air traps, unless otherwise indicated on the Drawings.
- B. Where 2 similar services run parallel to each other, piping for such services may be laid in the same trench. Lay piping with sufficient room for assembly and disassembly of joints, for thrust blocks, for other structures, and to meet separation requirements of public health authorities having jurisdiction.
- C. Laying Piping:
 - 1. Lay piping in finished trenches free from water or debris. Begin at the lowest point with bell ends up slope.
 - 2. Place piping with top or bottom markings with markings in proper position.
 - 3. Lay piping on an unyielding foundation with uniform bearing under the full length of barrels.
 - 4. Where joints require external grouting, banding, or pointing, provide space under and immediately in front of the bell end of each section laid with sufficient shape and size for grouting, banding, or pointing of joints.
 - 5. At the end of each day's construction, plug open ends of piping temporarily to prevent entrance of debris or animals.

3.04 CLEANING

- A. Piping Cleaning:
 - 1. Upon completion of installation, clean piping interior of foreign matter and debris. Perform special cleaning when required by the Contract Documents.

3.05 HIGH HEAD METHOD OF TESTING PRESSURE PIPE

- A. General:
 - 1. Test connections, fittings, valves, and closure pieces with the piping.

2. Provide blinds or other means to isolate test sections.
3. Do not include valves, equipment or piping specialties in test sections if test pressure exceeds the valve, equipment or piping specialty safe test pressure allowed by the item's manufacturer.
4. During the performance of the tests, test pressure shall not vary more than plus or minus 5 pounds per square inch gauge with respect to the specified test pressure.
5. Select the limits of testing to sections of piping. Select sections that have the same test pressure.
6. Test piping for minimum 2 hours for visible leaks test and minimum 2 hours for the Pressure Test with Maximum Leakage Allowance.

B. Testing Procedures:

1. Fill piping section under test slowly with potable water while venting air. Temperature of test water shall be no higher than 73 degrees Fahrenheit. Use potable water.
2. Visible Leakage Testing:
 - a. Raise pressure to the test pressure indicated in the piping schedule and inspect piping visually for leaks. Consider visible leakage testing complete when no visible leaks are observed.
3. Pressure Test with Maximum Leakage Allowance:
 - a. Pressure test piping after completion of visible leakage test.
 - b. Accurately measure any makeup water necessary to maintain the pressure in the piping section under test during the pressure test period.
 - 1) Successful completion of the pressure test with maximum leakage allowance shall have been achieved when the observed leakage during the test period is equal or less than the allowable leakage and no damage to piping and appurtenances has occurred.
 - 2) Leakage allowance is zero.

3.06 PIPING SCHEDULE

A. Abbreviations:

1. The following abbreviations used in the column of test method refer to the respective methods.

GR	Gravity method
HH	High head method
2. Abbreviations to designate piping include the following:

BF	Butt fusion
BS	Bell and spigot

CI	Cast iron
CL	Class, followed by the designation
DWV	Drain, Waste, Vent
DIP	Ductile iron piping
FL	Flanged
Ga	Gauge, preceded by the designation
GE	Grooved end joint
HDPE	High Density Polyethylene
NPS	Nominal pipe size, followed by the number in inches, pounds per square inch, or pounds per square inch, gauge.
PE	Plain End
PEE	Polyethylene encasement
PVC	Polyvinyl Chloride
Sch	Schedule, followed by the designation
SCRD	Screwed
SS	Stainless Steel
	Sanitary Sewer
SS FM	Sanitary Sewer Force Main
SW	Solvent Weld
VCP	Vitrified clay piping
WLD	Weld

(The PIPING SCHEDULE follows on the next page.)

BASIC PIPING MATERIALS AND METHODS

PIPING SCHEDULE							
Process Abbrev.	Service	Nominal Diameter (inches)	Materials	Joints/ Fittings	Test Pressure/ Method	Lining	Coating
--	Pump discharge piping within wet well, between wet well and valves vault, and as shown on plans	All Sizes	SS	FL/PE	100 psi - HH	None	None
--	Valve vault piping where shown on plans	All Sizes	DIP	FL/PE	100 psi - HH	Fusion bonded epoxy	Fusion bonded epoxy
SS FM	Sewer force main downstream of valve vault	All Sizes	PVC	PE/BS	100 psi - HH	None	None
W	Potable Water	< 1" 1" to 3"	Copper PVC Sch 80	Soldered SW	100 psi - HH 100 psi - HH	None None	None None

END OF SECTION

**SECTION 15110
VALVES****PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Basic requirements for valves.
- B. Related Sections:
 - 1. Section 15052 - Basic Piping Materials and Methods.

1.02 REFERENCES

- A. American National Standards Institute/American Society of Mechanical Engineers (ANSI/ ASME):
 - 1. B16.1 – Cast Iron Pipe Flanges and Flanged Fittings
 - 2. B16.21 – Nonmetallic Flat Gaskets for Pipe Flanges.
 - 3. B16.34 – Valves - Flanged, Threaded, and Welding End.
- B. American Society for Testing and Materials (ASTM):
 - 1. A 167 – Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - 2. A 536 – Specification for Ductile Iron Castings.
 - 3. E 527 – Practice for Numbering Metals and Alloys (UNS).
- C. American Water Works Association (AWWA):
 - 1. C110 – Ductile Iron and Gray Iron Fittings, 3-inch through 48-inch.
 - 2. C 509 – Resilient-Seated Gate Valves for Water Supply Service.
 - 3. C 550 – Protective Epoxy Interior Coatings for Valves and Hydrants
- D. Steel Structures Painting Council (SSPC):
 - 1. SP 2 – Surface Preparation Specification for Hand Tool Cleaning.
 - 2. SP10 – Surface Preparation Specification for Near-White Blast Cleaning.

1.03 DESIGN REQUIREMENTS

- A. Pressure Rating:
 - 1. Suitable for service under minimum working pressures of 150 pounds per square inch gauge.
 - 2. When a piping system is specified in the Piping Schedule to be tested at a pressure greater than 150 pounds per square inch gauge, provide valves for that piping system with design working pressure which is sufficient to withstand the test pressure.
- B. Valve to Piping Connections:
 - 1. Valves 3 Inch Nominal Size and Larger: Flanged ends unless otherwise specified on Drawings.

2. Valves less than 3 Inch Nominal Size: Screwed ends.

1.04 SUBMITTALS

- A. Submittals Prior to Installation:
 1. Product Data: Submit detailed technical information relating to the valve including description of component parts, materials of construction, performance, dimensions, and weights.
- B. Operation and Maintenance Data:
 1. Furnish bound sets of installation, operation, and maintenance instructions for each type of valve 4 inch in nominal size and larger. Include information on valve operators in operation and maintenance instruction manual.
- C. Certification: Certified test reports with each delivery that the valve(s) comply with this specification.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 1. Valves: Manufactured by manufacturers whose valves have had successful operational experience in comparable service.
- B. Valve Connections: Suitable valves shall be provided to connect to adjoining piping as specified for pipe joints.

1.06 DELIVERY STORAGE AND HANDLING

- A. Protect valves and protective coatings from damage during handling and installation; repair coating where damaged.

PART 2 PRODUCTS

2.01 UNDERGROUND VALVES

- A. Provide underground valves with flanged, mechanical, or other type of joint required for the type of pipe to which the valve is to be connected.
- B. Coating and Wrapping:
 1. Prior to installation, coat buried valves with 2 coats of protective coal tar.
 2. After installation, wrap valves with polyethylene
 - a. Ascertain that polyethylene wrapping does not affect operation of valve.

2.02 INTERIOR PROTECTIVE COATING

- A. Provide valves with type of protective coating specified in the particular valve specification.

- B. Apply protective coating to interior, non-working surfaces, except stainless steel surfaces.
- C. Coating Types:
 - 1. Powder Epoxies:
 - a. Manufacturers: One of the following or equal:
 - 1) 3-M Company, ScotchKote 134; certified to NSF 61 for drinking water use.
 - b. Clean surfaces to meet SSPC-SP-10, near white metal blast cleaning, with grit of size recommended by epoxy manufacturer.
 - c. Apply in accordance with manufacturer's published instructions.
 - d. Coating Thickness: 0.010 to 0.012 inches except that:
 - 1) Coating Thickness in Grooves for Gaskets: 0.005 inches.
 - 2) Do not coat seat grooves in valves with bonded seat.
 - e. Quality Control:
 - 1) Coating Thickness: Measured with a non-destructive magnetic type thickness gauge.
 - 2) Verify coating integrity with a wet sponge-testing unit operating at approximately 60 volts.
 - 3) Consider tests successful when coating thickness meets specified requirements and when no pinholes are found.
 - 4) Correct defective coating disclosed by unsuccessful tests, and repeat test.
 - 5) Repair pinholes with liquid epoxy recommended by manufacturer of the epoxy used for coating.

2.03 GATE VALVES

- A. Gate valves shall be resilient seat gates, suitable for use in wastewater applications.
 - 1. Buried valves shall have 2-inch operating nuts
 - 2. Valves above grade or in vaults shall have hand wheels

2.04 CHECK VALVES

- A. Waste water check valves will be flanged ball type valves as produced by Flygt.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Preparation: Required Information Prior to Installation:
 - 1. Install valves after the required submittal on installation has been accepted.

2. Determine, after flanged valves and flanged check valves are selected, the face-to-face dimensions of flanged valves and flanged check valves.
- B. Fabricate piping to lengths taking into account the dimensions of flanged valves and flanged check valves.

3.02 INSTALLATION

- A. Provide incidental work and materials necessary for installation of valves including flange gaskets, flange bolts and nuts, valve boxes and covers, concrete bases, blocking, and protective coating.
- B. Where needed, furnish and install additional valves for proper operation and maintenance of equipment and plant facilities under the following circumstances:
1. Where such additional valves are required for operation and maintenance of the particular equipment furnished by CONTRACTOR.
 2. Where such additional valves are required as a result of a substitution or change initiated by CONTRACTOR.
- C. Install Valves with their stems in vertical position above the pipe, except as follows:
1. Gate valves above ground, globe valves, ball valves, and angle valves may be installed with their stems in the horizontal position.
- D. Install valves so that handles clear obstructions when the valves are operated from fully open to fully closed.
- E. Place top of valve boxes flush with finish grade or as otherwise indicated on the Drawings.
- F. Valves with Threaded Connections:
1. Install valves by applying wrench on end of valve nearest the joint to prevent distortion of the valve body.
 2. Apply pipe joint compound and Teflon tape on external (male) threads to prevent forcing compound into valve seat area.
- G. Valves with Flanged Connections:
1. Align flanges and gasket carefully before tightening flange bolts.
 2. When flanges are aligned, install bolts and hand tighten.
 3. Tighten nuts opposite each other with equal tension before moving to next pair of nuts.
- H. Valves with Soldered Connections:
1. Do not overheat connection to prevent damage to resilient seats and metal seat rings.

2. Position valves in full open position before starting soldering procedure.
3. Apply heat to piping rather than to valve body.

3.03 TESTING

- A. Valves shall be tested at the same time that the adjacent pipeline is tested. Joints shall show no visible leakage under test. Joints that show signs of leakage shall be repaired prior to final acceptance. If there are any special parts of control systems or operators that might be damaged by the pipeline test, they shall be properly protected. The Contractor shall be held responsible for any damage caused by the testing.
- B. If requested by the City, the valve manufacturer shall furnish an affidavit stating that the materials and options furnished comply with these specifications.

END OF SECTION

**SECTION 15250
PIPE AND FITTINGS**

PART 1 GENERAL**1.01 SUMMARY**

- A. Section Includes: Pump discharge pipe and fittings.
- B. Related Sections:
 - 1. Section 09800 – Coating Systems.
 - 2. Section 15052 – Basic Piping Materials and Methods.
 - 3. Section 15110 – Valves.

1.02 REFERENCES

- A. American Society of Testing and Materials (ASTM):
 - 1. D 3034 - Standard Specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.
- B. American National Standards Institute (ANSI):
 - 1. B 16.5 – Steel Pipe Flanges and Flange Fittings
 - 2. B 36.19M – Stainless Steel Pipe
- C. American Water Works Association (AWWA):
 - 1. C 110 - Ductile Iron and Gray Iron Fittings, 3-inch through 48-inch.
 - 2. C 200 – Steel Water Pipe 6 Inches and Larger.
 - 3. C 206 – Field Welding of Steel Water Pipe.
 - 4. C 207 – Steel Pipe Flanges for Waterworks Service.
 - 5. C 210 - Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines.
 - 6. C 213 - Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines.
 - 7. C 220 – Stainless-Steel Pipe , 4 In. and Larger
 - 8. C 606 - Grooved and Shouldered Joints
 - 9. C 900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings

1.03 SUBMITTALS

- A. Material List:
 - 1. Submit a complete material list prior to performing any work. The material list shall include the manufacturer, model number and description of all materials and equipment to be used.
 - 2. Equipment or materials installed or furnished without prior acceptance may be rejected and if so shall be removed from the site by the Contractor.
- B. Record Drawings:
 - 1. Provide Record Drawings in accordance with project requirements and as follows.

- a. Dimension from two permanent points of reference, such as building corners, the location of the connection to the existing water line, and routing of the new water line.

1.04 QUALITY ASSURANCE

- A. The Contractor shall furnish all labor necessary to assist the Engineer in inspecting pipe upon delivery. The Contractor shall remove rejected pipe immediately.
- B. All pipe of any manufacturer may be rejected if there are unsatisfactory joint assembly operations, even if the pipe conforms to ANSI and AWWA Specifications. The Contractor shall remove all unsatisfactory pipe of that manufacturer of same shipment from work and shall furnish pipe from another manufacturer conforming to these specifications.
- C. All tests shall be made in conformance with methods prescribed by ASTM and AWWA specifications, and acceptance or rejection is based on the test results.
- D. Mark ductile iron pipe with nominal size, type, class, schedule or pressure rating, manufacturer and all markings required by applicable ASTM and AWWA standards.
- E. For purposes of clarity and legibility, the drawings are essentially diagrammatic to the extent that many offsets, bends, unions, special fittings, and exact locations of items are not indicated, unless specifically dimensioned
- F. Exact routing of piping, etc., shall be governed by structural conditions, obstructions. Contractor shall make use of data in the Contract Documents and actual site conditions.
- G. The Contractor shall not willfully install pump discharge piping systems as shown on the Drawings when it is obvious in the field that unknown obstructions, grade differences or discrepancies in area dimensions exist. Such obstructions or differences shall be brought to the attention of the Engineer. In the event this notification is not performed, the Contractor shall assume full responsibility for any revision necessary.
- H. The Contractor is responsible for furnishing and installing all items necessary to make a complete and workable piping system. These include, but are not limited to insulating couplings and gaskets, support and sway brackets, piping specialties and all other items required by the nature of the installation. Any item not specified herein but required by the nature of the installation shall be of the first quality and equal in grade to similar materials specified herein.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect piping materials from sunlight, scoring and distortion.
- B. Do not allow surface temperatures on pipe and fittings to exceed 120 degrees Fahrenheit.

- C. Store and handle pipe and fittings as recommended by manufacturer in published instructions.

PART 2 PRODUCTS

2.01 STEEL PIPE

- A. **General:** Pipe sizes are nominal outside diameter unless otherwise noted. All sizes shall be as called out on the plans and specified herein. All pipe and fittings delivered to the job site shall be clearly marked to identify the material, class, thickness, and manufacturer. All material shall be new and free of blemishes.
- B. **Stainless Steel:** Stainless steel pipe shall be type 316 stainless steel and Schedule 40S per ANSI/ASME B36.19M.
- C. **Ductile Iron Pipe:** ANSI/AWWA C151/A21.51 A53, pressure class 350 (0.25-inch wall thickness). All ductile iron piping and fittings shall be fusion bonded epoxy lined and coated. Flanges shall be factory assembled. Ductile iron piping with flanges will be thickness Class 53.
- D. All products shall bear the seal of a nationally recognized listing or certifying agency, with the following markings:
 - 1. Manufacturer's name
 - 2. Nominal pipe size
 - 3. Schedule or class
 - 4. ASTM designation
 - 5. Resin manufacturer code
 - 6. Lot number and date of manufacture

2.02 PVC PIPE

- 1. Polyvinyl chloride (PVC) pipe for gravity sanitary sewer use shall be at least SDR 26 cell classification 12454-B, conforming to ASTM Designation D3034.
- 2. Force main PVC pipe shall be AWWA C900 CL 235, SDR 18 pipe.

2.03 PIPE FITTINGS

- A. **Grooved Fittings:** Fittings for grooved pipe shall be compatible with the specified adjoining piping systems. Fittings for grooved pipe joints shall be ductile iron, steel designed specifically or stainless steel for use in grooved piping systems.
- B. **Flanged Fittings:** Fittings for flanged connection to the pump discharge base shall be in conformance with AWWA C110.
 - 1. **Pattern:** All fittings shall be flanged to ANSI B16.1 Class 125 standard pattern

- C. **Mechanical Joint Fittings:** Fittings for mechanical joint fittings shall be in conformance with AWWA C110 and C111. All mechanical joints shall be restrained with restraining glands.
- D. **Coating and Lining:** Iron and steel fittings shall be fusion-bonded epoxy lined and coated at the factory per AWWA C213.

2.04 PIPE JOINTS

- A. Discharge pipe shall be joined by flanged or grooved joints as shown on the Drawings.
- B. **Flanged Joints:** Provide full face gaskets per AWWA C111.
- C. **Flanged Coupling Adapters:** Flange coupling adapters shall be provided as shown on the Drawings or as deemed necessary by the Contractor for pipe assembly. Couplings shall be Victaulic Style 341 flange adapter for grooved joints, or equal. Adapter material shall be ductile iron coated with fusion bond epoxy in conformance with AWWA C116.
- D. **Grooved Joints:** Grooved pipe couplings for steel pipe shall be Victaulic Style 77 flexible couplings or equal. Grooved pipe couplings shall be fusion bonded epoxy coated inside and out.
- E. **Gaskets, Bolts and Nuts:** Gaskets shall be rated for wastewater service, made of synthetic rubber such as Buna-N not less than one-eighth (1/8) inch thick. All gaskets shall be the full width of the flange to which applied. Bolts and nuts shall be ASTM A316 stainless steel, and shall have sound well-fitting threads. Bolts shall be provided with hexagonal chamfered heads and nuts. The underside of all bolt heads and nuts shall have true surfaces at right angles to the axis of the bolts. The lengths of the bolts shall be such that after joints are made up, the bolts shall protrude through the nuts, but in no case shall they protrude more than one-half (1/2) inch. Anti-galling compound shall be used in installation.

PART 3 EXECUTION

3.01 GENERAL

- A. Pump discharge piping shall be installed in accordance with all applicable local and state codes and ordinances, and AWWA C600. The methods employed in the handling and placing of pipe, fittings, and equipment shall be such as to insure that after installation and testing they are in good condition. Should damage occur to the pipe, fittings, or equipment, repairs satisfactory to the City shall be made at no additional cost to the City.
- B. Follow manufacturer's directions except as shown or specified.
- C. Piping installations shall be restrained from movement without the use of concrete thrust blocks.

3.02 INSPECTION

- A. All discharge piping drawings are approximate. The design is diagrammatic, so actual routing may vary. The Contractor shall pothole to check and verify existing water service dimensions and location prior to proceeding with work specified under this Section.
- B. Exercise extreme care in excavating and working near completed work. Contractor shall be responsible for damages to facilities which are caused by his operations or neglect.
- C. Coordinate installation of pump discharge pipe so there shall be no interference with utilities, structural slabs and walls, paving, etc.

3.03 PREPARATION

- A. Prior to installation, stake out the discharge pipe routing.
- B. All layouts shall be reviewed by the Engineer prior to installation.
- C. Coordinate pipe installation work with the installation of other improvements, including structural, electrical, and mechanical work.

3.04 PROTECTION

- A. The Contractor shall provide adequate protection for all work until completion and final acceptance. Contractor shall take particular precautions to protect: existing structures and equipment, and improvements made under this contract. All damaged, stained or disturbed items shall be replaced at the expense of the Contractor, prior to final acceptance.
- B. The Contractor shall be responsible for damages to the grounds, walks, roads, buildings, piping systems, electrical systems and their equipment and contents caused by leaks in the drain systems being installed or having been installed by him. He shall repair at his own expense all damage so caused, to match existing undamaged work. All repair work shall be done as approved by the Engineer.
- C. During loading, transportation and unloading of pipe, every precaution shall be taken to prevent pipeline damage. Any damaged pipe shall be replaced or repaired to the satisfaction of the City. Where pipe is placed in stockpiles, it shall be neatly piled and blocked with strips between tiers.

3.05 CONNECTIONS

- A. Thoroughly clean pipe and fittings of dirt, dust and moisture before installation. Installation and joining methods shall be as recommended by the pipe and fitting manufacturers.
- B. Cut pipe square for good joint integrity. After cutting pipe, ream inside and chamfer outside to remove burrs, shoulders and ragged edges.

- C. Join ductile iron pipe and fittings with specified gaskets, bolts, and nuts.
- D. Non-conducting connections shall be provided wherever jointing dissimilar metals.

3.06 SUPPORT

- A. Support piping at intervals of not more than four feet, at all branches, at changes of direction, and when using large fittings to reduce stress.
- B. Pipe supports shall allow for axial contraction and expansion.

END OF SECTION

**SECTION 16010
ELECTRICAL GENERAL REQUIREMENTS**

PART 1 – GENERAL**1.01 SUMMARY**

- A. Section Includes
 - 1. General requirements for products and work related to electrical power, and communications.
- B. Related Documents
 - 1. Contract General Conditions, Supplementary General Conditions and Division 1.
 - 2. Contract Drawings which accompany the Specifications.
- C. Intent
 - 1. It is the intent that the provisions of this Section apply to all Division 16 Sections of the Specifications whether or not specifically referenced in those Sections.

1.02 SCOPE

- A. Provide all labor, materials, tools, transportation, equipment, services and facilities necessary for, required in connection with, or properly incidental to the complete and proper installation of all electrical work described in these Specifications, shown on the Drawings, or reasonably implied therefrom, except as specifically indicated to be excluded.
- B. Work shall include:
 - 1. Demolition of existing electrical systems in accordance with project drawings.
 - 2. All cutting and patching necessary for the proper installation of electrical work and coordinating this work with that of the other crafts. Holes shall be held to the minimum required for the work to be installed. Patch all openings to match adjacent area using the materials and methods specified in the Sections of these Specifications covering the applicable material conditions encountered. All joints shall be tight, even and smooth.
 - 3. Provision of all excavating and backfilling for electrical work. Include all cutting of existing paving and concrete surfaces and removal and off-site disposal of spoil. Backfill materials shall be as shown on the Electrical Drawings. Backfill in approximately 6-inch layers, water tamped for each layer. Provide minimum 95 percent relative compaction unless otherwise

noted on the Drawings. Restore all disturbed surfaces to original condition, properly installed to eliminate settlement. Replace paving and concrete, including sub-base materials, removed for trenching in accordance with the Cutting and Patching requirements of Section 16050 Basic Electrical Materials and Methods.

4. Locating all existing underground utility within areas of project work including but not limited to power, telephone, c.a.t.v., gas, water, storm and sanitary sewer lines. Locating shall be accomplished by qualified locating services.
- C. Contractor shall be held to have examined the site and compared it with the Specifications and Drawings and to have become familiar with the conditions under which the work is to be performed. Contractor shall be held responsible for knowledge of all existing conditions whether or not accurately described. No subsequent allowance shall be made for any extra expense due to failure to make such examination.

1.03 CODES, RULES AND REGULATIONS

- A. All electrical work and materials shall be in full accordance with all applicable provisions of the following:
1. 2016 California Electrical Code (CEC).
 2. California Building Code (CBC), latest adopted edition.
 3. California Fire Code (CFC), latest adopted edition.
 4. California Mechanical Code (CMC), latest adopted edition.
 5. Local codes, rules and regulations.
- B. When the Specifications or Drawings call for materials or construction of larger size, better quality or stricter requirements than required by applicable codes, rules or regulations, the Specifications and Drawings shall take precedence.
- C. Nothing in these Specifications or on the Drawings shall be construed as to permit any work or material which is not, as a minimum, in conformance with all applicable codes, rules and regulations.
- D. Furnish without additional charge any additional material and labor as may be required for compliance with applicable codes, rules and regulations even though such work is not specifically mentioned in these Specifications or shown on the Drawings.

1.04 LICENSES, PERMITS, FEES AND UTILITY CHARGES

- A. Electrical Contractor shall possess a C-10 license and all other licenses as may be required. Licenses shall be in effect at the commencement of this Contract and shall be maintained in a valid state throughout the execution of this Contract.

- B. Contractor shall pay all inspection and other applicable fees and procure all permits necessary to the prosecution and completion of his work.

1.05 TEMPORARY CONSTRUCTION POWER

- A. Make all arrangements and provide all necessary facilities for temporary construction power from Owner's on-site source in accordance with Division 1 Temporary Facilities and Controls. Energy costs for construction power shall be paid for by the Owner.

1.06 PROTECTION

- A. Protect all work, materials and equipment from damage from any cause whatsoever and provide adequate and proper storage facilities during the progress of the work.
- B. Provide for the safety and good condition of all work until final acceptance of the work by Owner. Replace all damaged or defective work, materials and equipment before requesting final acceptance.

1.07 SAFETY PRECAUTIONS

- A. Provide and maintain throughout the work adequate safeguards, including barriers, warning signs, enclosures and lights to prevent accidental injury to persons and damage to property.

1.08 DRAWINGS

- A. The general arrangement of electrical work, as shown on the Drawings, is diagrammatic and approximately correct as to locations. Where minor changes are required because of structural conditions or for the convenience of the Owner, such changes shall be made without additional expense to the Owner.
- B. The Contractor shall be responsible for the accurate location of all electrical installations with respect to the work of the other trades. No extras will be allowed for moving Division 16 work to avoid interference with work of the other trades.
- C. Verify all measurements in field, be responsible for correctness of same. No extra compensation will be allowed because of difference between work shown on Drawings and field measurements.
- D. Data given herein and on the Drawings are as exact as could be secured, but their absolute accuracy cannot be guaranteed. Drawings and Specifications are for assistance and guidance only; exact locations, distances, levels, etc., shall be governed by field conditions. Contractor shall use same with this understanding.

1.09 RECORD DRAWINGS

- A. Provide in accordance with Division 1 Closeout Procedures and all of the following.
- B. Throughout the course of construction, the Electrical Contractor shall maintain a complete set of the Electrical Drawings which shall be identified as the "RECORD DRAWINGS". These Drawings shall be kept at the job-site, and the construction conditions shall be clearly annotated regularly thereon.
- C. The recorded data shall include:
 - 1. Sizes of all conduit runs larger than ½ inch when not shown on the Drawings or when revised by Change Order or field directive.
 - 2. Routes, and depths of all underground conduit runs beyond building perimeter. Show location of conduit stubout ends using two dimensions from fixed (permanent) reference points located approximately 90 degrees apart in azimuth.
 - 3. Homerun points of all branch circuits.
 - 4. Locations of all electrical equipment including switchgear, transformers, panelboards, control equipment, disconnect switches, pull cans and pull boxes.
 - 5. Additions or deletions which are the result of approved Change Orders or approved in-field revisions.
 - 6. All other items as may be required to make the Drawings reflect the actual job conditions at the completion of construction.
- D. Upon completion of construction, Contractor shall review the Record Drawings for accuracy, sign the drawings certifying their accuracy, and deliver the drawings to the Owner within 15 days after completion of construction.

1.10 MATERIALS

- A. All materials and equipment shall be furnished as specified in strict accordance with these Specifications and the Drawings, and shall be new and free from defects. Reuse of existing is permitted only where specifically directed or indicated on the drawings.
- B. Materials and equipment shall be UL listed, labeled and approved for the purpose for which they are to be used wherever standards have been established and label/listing service is regularly furnished by that agency.
- C. Materials and equipment shall be the standard products of reputable manufacturers regularly engaged in the production of such materials or equipment. All materials of a given type shall be of the same manufacturer and quality.

1.11 SUBSTITUTIONS

- A. In accordance with Division 1 Product Requirements and all of the following.
- B. Contractors shall base their bids on materials and equipment specified. After the award of the contract, substitutions may be submitted for Engineer's approval subject to the requirements listed hereafter.
- C. Prior approval of proposed electrical substitutions will not be given during bidding. Consideration will be given to proposed substitutions only after award of the Contract.
- D. Only one submittal of a proposed substitution for each type of electrical equipment or material will be considered. To obtain consideration, each proposed substitution must be:
 - 1. Listed as a proposed substitution and submitted within ten (10) days following award of the Contract. After the ten day period consideration will be given only for cases of product non-availability or other conditions beyond control of the Contractor.
 - 2. Of similar size and appearance, and of same or better quality, capacity and ratings as the specified product.
 - 3. Accompanied by shop drawings and/or complete descriptive information.
 - 4. Proven to the Engineer to be equal or superior to the specified item in all respects. Engineer's decision is final.
- E. Any dimensional or electrical change, or change to the work of other trades which is required by, or is a result of, an accepted electrical substitution shall be the sole and complete responsibility of the Electrical Contractor and shall be made at no additional cost to the Owner or the other trades performing work on the project.
- F. If a proposed substitution is rejected by the Engineer, Contractor shall furnish the specified product at no increase in Contract price.
- G. Contractor shall make no substitutions of materials or equipment without the written approval of the Engineer.

1.12 APPROVAL OF MATERIALS

- A. Electrical materials and equipment provided under this Contract are subject to review and approval by the Electrical Engineer prior to purchase and installation. Submit for approval in accordance with Division 1 Submittal Procedures and all of the following.
- B. Submittals shall include manufacturer's names and catalog numbers, complete descriptive data, and shop drawings or other information where required.

- C. Descriptive data submittals shall be clearly annotated to indicate applicable features, ratings and catalog or part numbers.
- D. Shop drawings shall be included where specified and shall show all features including equipment dimensions and weights, component layouts and part numbers, electrical characteristics and wiring diagrams. Features not applicable to this Contract shall be neatly blacked out or otherwise deleted from the shop drawings.
- E. Install no equipment or materials without the Engineer's approval. Engineer may direct that any unapproved materials and/or equipment be removed and replaced with approved items without change in the Contract price.
- F. The review of submittals and any approval thereof by the Engineer shall not relieve the Contractor from responsibility for compliance with the requirements and intentions of these Specifications and the Drawings.

1.13 SUPERVISION AND WORKMANSHIP

- A. Contractor shall personally, or through an authorized and competent representative, constantly supervise the work covered by these Specifications and the Drawings and, insofar as possible, keep same foreman and workmen on the job from start to finish.
- B. All electrical equipment and material shall be installed in a neat and workmanlike manner in accordance with NECA National Electrical Installation Standards No. NECA 1-2000, Standard Practices for Good Workmanship in Electrical Contracting.

1.14 COOPERATION WITH OTHER TRADES

- A. Cooperate with the other trades as may be necessary for the proper execution of the work of the various trades employed in the construction of this project. Refer to Civil, Mechanical, Plumbing and other Contract Drawings for construction details, and coordinate work with that of the other trades.

1.15 STRUCTURAL CONDITIONS

- A. Cutting, boring, drilling or tapping of structural members and footings or the installation of chases there-in is not permitted without the prior written approval of the Structural Engineer. Lay out the work to clearly indicate the locations and extent of the required holes, notches, etc., including depths of penetrations and obtain the required approval before proceeding with the installation. Notches, holes, etc. shall be carefully held to the approved sizes.

1.16 INSPECTION

- A. All work and materials covered by the Drawings and these Specifications shall be subject to inspection at any and all times by the Owner's Representative.

- B. If inspector finds that any material does not conform to the Drawings or these Specifications, Contractor shall remove said material from the premises. If said material has been installed, entire expense of removing and replacing same, including any cutting and patching that may be necessary, shall be borne by Contractor.

1.17 TESTS

- A. Test electrical systems in accordance with requirements of Section 16050 Basic Electrical Materials and Methods and the specification sections covering specific types of electrical equipment and devices.

1.18 REPAIR OF DAMAGE

- A. All damage resulting from work done under the Division 16 Sections of these Specifications shall be repaired by the Contractor to the satisfaction of the Owner's Representative at no additional cost to the Owner.

1.19 CLEAN UP

- A. Perform clean-up in accordance with Section 16050 Basic Electrical Materials and Methods.

1.20 GUARANTEE

- A. Contractor shall leave the entire electrical system in proper working order. Any item of material, apparatus, or workmanship supplied by the Contractor showing defects of design, construction, or quality within one (1) year of final acceptance by the Engineer shall be replaced by such new material, apparatus, or parts as may be found necessary to make such defective portion of the complete system conform to the true intent and meaning of the Drawings and Specifications. Changes, repairs and replacements made during the warranty period shall be made by the Contractor at no cost to the Owner.

1.21 HAZARDOUS MATERIALS

- A. As used hereafter, the term "hazardous materials" shall mean any toxic substance - or any material, appliance or equipment containing any toxic substance - where such substance is listed, regulated, and/or controlled by State of California, OSHA or EPA rules, laws or regulations. Hazardous materials shall include but not be limited to asbestos, asbestos products, mercury and polychlorinated biphenyls (PCB's).
- B. H.I.D. and fluorescent lamps shall be treated as hazardous materials to the extent regulated.
- C. In the event hazardous materials or wastes are encountered or located on the job, the Contractor shall immediately notify the Engineer and Owner's

Representative and immediately halt all work in the area affected by those materials. The Owner shall then retain the services of a competent, qualified abatement contractor licensed in the State of California to remove the hazardous materials as per State, OSHA and EPA regulations, recommendations and guidelines.

- D. The provision of, or installation of, any new or used electrical materials or equipment containing asbestos or PCB's is expressly prohibited.
- E. The Electrical Engineer shall have no responsibility for the discovery, presence, handling, removal or disposal of, or exposure of persons to any hazardous materials in any form at the Project Site.

PART 2 – PRODUCTS – Not Used

PART 3 – EXECUTION – Not Used

END OF SECTION

**SECTION 16050
BASIC ELECTRICAL MATERIALS AND METHODS**

PART 1 – GENERAL**1.01 SECTION INCLUDES**

- A. Coordination.
- B. Electrical installation, general requirements.
- C. Cutting and patching.
- D. Electrical equipment bases and supports, including supplementary framing.
- E. Electrical work for equipment provided by other trades.
- F. Testing.
- G. Cleaning electrical work.

1.02 RELATED SECTIONS

- A. Section 16010 Electrical General Requirements.
- B. Division 3 Cast-in-Place Concrete.
- C. Division 1 Cutting and Patching.
- D. Division 9 Painting.

1.03 REFERENCES

- A. Reference Standards:
 - 1. ANS American National Standards Institute.
 - 2. ASTM American Society for Testing and Materials.
 - 3. CFR Code of Federal Regulations.
 - 4. ICEA Insulated Cable Engineers Association.
 - 5. IEEE Institute of Electrical and Electronics Engineers Inc.
 - 6. NBFU National Board of Fire Underwriters.
 - 7. CEC California Electrical Code.
 - 8. NEMA National Electric Manufacturers' Association.

9. NFPA National Fire Protection Association.
10. UL Underwriters' Laboratories, Inc.

1.04 QUALITY ASSURANCE

- A. Installers: Provide adequate number of skilled workmen, trained and experienced in necessary crafts, and completely familiar with specified requirements and methods needed for proper performance of Work.
- B. Materials and Equipment: Install in accordance with manufacturer's recommendations.
- C. Workmanship: Perform Work in accordance with good commercial practice. Workmanship includes electrical efficiency and finished appearance.
- D. Supervision: Coordinate work of all subcontractors performing work under Division 16.

PART 2 – PRODUCTS

2.01 MATERIAL AND EQUIPMENT

- A. General: Provide products which are new, and of same manufacture and type for similar uses, except as otherwise accepted.
- B. UL Listing and Labels: Provide products listed and labeled by UL and bearing UL Inspection Label where inspection standards have been established.
 1. Where UL testing standard is available for electrical products, Provide UL listed products.
- C. Industry or Trade Standards: Where industry or trade standards are in effect, provide products complying with applicable standards as a minimum criteria of quality and workmanship.

2.02 STRUCTURAL FITTINGS AND PENETRATION MATERIALS

- A. General: Provide necessary sleeves, inserts, hangers, anchor bolts, and related structural items.
- B. Anchor Bolts and Inserts: Galvanized, of adequate size and strength for installation of electrical Work.
 1. Expansion shields: Allowed only with specific acceptance of Structural Engineer. Wood and soft metal plugs are not acceptable.

PART 3 – EXECUTION**3.01 PREPARATION**

- A. Scheduling and Planning: Review construction schedules; plan work to permit completion within scheduled time frames.
 - 1. Insure adequate number of trained personnel available to perform work at required times.
 - 2. Order materials with sufficient lead-time to insure on time delivery.
- B. Field Measurements: Base final installation of materials and equipment on field dimensions and conditions. Field dimensions shall take precedence over Drawing dimensions. Field measure critical dimensions and do not fabricate or cut materials to size until such measurements are made. Be responsible for accurate location of rough-ins as required for equipment being served.

3.02 COORDINATION

- A. Coordinate with work of other trades.
- B. Coordinate with Mechanical and Plumbing Work.
 - 1. Verify that power requirements for motorized equipment as shown on the Electrical Drawings are correct for actual equipment being installed. Report differences to Engineer for direction.
 - 2. Review electrical installations for conflicts with piping. Immediately report all unresolvable conflicts to Engineer for direction.
- C. Coordinate with other trades to allow for proper installation of electrical equipment, conduit, fixtures, and the like.
 - 1. Properly locate anchors, chases, recesses and openings required for proper installation of Work.

3.03 INSTALLATION – GENERAL

- A. Seismic Design: Be responsible for anchors and connections of electrical work to structure to prevent damage as result of earthquake. Install in accordance with California UBC 1998, Zone 4. When requested submit calculations for anchors and connections signed by Structural Engineer licensed in the State of California.

- B. Accessibility and Clearance: Install electrical equipment, outlets, junction boxes, and pull boxes in accessible locations, avoiding obstructions, preserving headroom, and keeping openings and passageways clear.
 - 1. Minor adjustments in location of equipment: Make when necessary, providing such adjustments do not adversely affect functioning equipment.
- C. Structural Fittings and Penetrations: Install inserts, hangers, anchor bolts, and related structural items at proper time in coordination with work of other trades.

3.04 EXISTING FACILITIES

- A. Connections between new and existing work: Make in neat and acceptable manner with minimum interference to existing facilities. Restore existing disturbed work to original condition including maintenance of wiring continuity as required.

3.05 CUTTING AND PATCHING

- A. Comply with requirements of Division 1 and as specified herein.
- B. General: Be responsible for costs of cutting and patching for work under Division 16.
- C. Cutting: Coordinate and supervise cutting required.
 - 1. Provide core drilling of concrete for passage of electrical items.
 - 2. Cut existing construction using methods least likely to damage adjoining construction.
 - 3. Temporarily cover openings when not in use.
- D. Patching: Seal openings and repair and refinish any damage to building elements using skilled mechanics of trades involved. Match existing adjoining construction to maximum extent possible.
 - 1. Waterproofed surfaces: Coordinate with appropriate Section of Specifications covering such work to ensure continuity of waterproofing.
 - 2. Concrete Sidewalks: As specified in Division 2 Cement Concrete Pavement.
 - 3. AC Paving: Unless otherwise specified use asphalt concrete having ½ inch maximum, medium gradation per Section 39 of the State Standard Specifications. Thickness shall match existing. Sub-base shall match existing as the material and thickness.

3.06 EQUIPMENT BASES AND SUPPORTS

- A. Supplementary Framing: Provide supporting steel not indicated on Structural Drawings for equipment requiring supplementary framing.
 - 1. Fabricate supports in accordance with Structural Specifications and applicable codes.
 - 2. Supplementary framing: Designed to carry weight of equipment, conduit, piping, and contents and to withstand thrust exerted by expansion or contraction of piping.
 - 3. Seismic design: Design supplementary framing to resist seismic forces as specified above.
 - 4. Brace and fasten supplementary framing to structure in accepted manner.
 - 5. Finish (Ferrous Metal): Hot-dipped galvanized finish or provide one coat rust inhibiting primer, shop applied, after fabrication with one coat of rust inhibiting paint applied after installation.

3.07 ELECTRIC WORK FOR EQUIPMENT PROVIDED BY OTHER TRADES:

- A. Under the work of Division 16 provide work and materials as specified in B. through G below for electrically powered equipment provided by other trades.
- B. Electrical Contractor shall coordinate installation of equipment with trades providing such equipment. Electrical Contractor shall meet with trades providing electrically powered equipment and review all electrical requirements (voltage, phase, power, controls, location, etc.) prior to rough-in. Notify Engineer of discrepancies.
- C. Provide complete line voltage power connections for all electrically powered equipment furnished by others as indicated on the Electrical Drawings and in accordance with the requirements of the equipment installed.
- D. Locations of equipment as shown on the Electrical Drawings are diagrammatic and approximately correct. Verify exact locations in field with trades furnishing equipment.
- E. Coordinate with the trades or persons providing the equipment and verify voltage, phase, ampacity and connection point for each piece of equipment to insure electrical power sizes and ratings as shown on the Electrical Drawings are adequate for the actual equipment being installed. Notify Engineer of any changes in sizes or ratings of electrical work which are required to accommodate the actual equipment being installed.
- F. Under Division 16 work furnish, install and connect the following for equipment as noted on the plans:

1. Conduit and wiring for line voltage power to the equipment.
 2. Magnetic motor starters when not furnished with, or as an integral part of, the equipment.
- G. Unless otherwise indicated on the Drawings or elsewhere in these Specifications, magnetic motor starters furnished under Division 16 shall be of types, NEMA sizes and voltage required for motors served and shall have, as a minimum, all of the following:
1. 120V operating coil; provide control circuit transformer with primary and secondary fusing.
 2. Thermal overloads (with one thermal unit for single phase and three thermal units for three phase starters).
 3. Hand-Off-Auto selector switch.
 4. Red "running" pilot light.
 5. One normally open holding circuit contact.
 6. One normally open and one normally closed auxiliary contacts.

3.08 TESTING

- A. Electrical System Testing and Adjusting: Adjust and test entire system.
1. Test all wiring for continuity, short circuits, and improper grounds.
 2. Test all receptacles for proper connections.
 3. Test all circuits for proper neutral connections.
 4. Insulation resistances: Test for compliance with values required by applicable electrical code.
- B. Equipment and Device Checking and Adjusting: Check for correct functional performance in accordance with apparatus ratings, operating sequence, and code requirements.
1. Motors: Check and adjust for correct direction of rotation.
- C. Refer to all other Division 16 Sections of these Specifications for additional adjusting and testing requirements.
- D. Furnish all equipment, labor and temporary wiring required for tests. Remove and replace all defective workmanship and materials at no expense to Owner.

3.09 CLEANING

- A. Clean all electrical equipment, including switchgear, panelboards, switches, and other devices of grease, dirt, and other foreign matter.
- B. Clean up and remove all debris and materials not installed in work, leaving premises clean.
- C. Lighting fixtures: Clean, polish metal and glass work.. Wipe lamps clean.

END OF SECTION

**SECTION 16110
RACEWAYS****PART 1 – GENERAL****1.01 SECTION INCLUDES**

- A. Requirements for raceway systems including conduit, tubing, surface raceway and wireways.
- B. Fittings for raceways.

1.02 RELATED SECTIONS

- A. Section 16010 Basic Electrical Requirements.
- B. Section 16050 Basic Electrical Materials and Methods.
- C. Section 16120 Wire and Cables.
- D. Section 16130 Boxes.

1.03 SUBMITTALS

- A. Product Data: Submit in accordance with requirements of Section 16010. Provide data for each raceway type.

PART 2 - PRODUCTS**2.01 MANUFACTURERS**

- A. Steel Conduit and Tubing: ALLIED or equal
- B. PVC Coated Steel Conduit: T&B Ocal Blue or equal.
- C. Fittings and Connectors for Metal Conduit/Tubing: APPLETON or equal
- D. Rigid PVC Conduit and Fittings: CARLON
- E. Wireways and Auxiliary Gutters: HOFFMAN or equal
- F. Metal Conduit Bodies: APPLETON or equal

2.02 MATERIALS

- A. All conduits shall be U.L. listed and bear the label of the National Board of Fire Underwriters.
- B. Rigid Steel Conduit (GRS): Hot-dipped galvanized with threaded, one-piece couplings and factory made elbows. Nipples through 12" in length shall be

factory made. Connectors threaded type with bonding locknut, insulated throat and neoprene O-ring.

- C. PVC Coated GRS: Hot-dipped galvanized with threaded, one-piece couplings and factory made elbows. Nipples through 12" in length shall be factory made. Connectors threaded type with bonding locknut, insulated throat and neoprene O-ring. PVC coated; blue urethane coating over threads; 40mil PVC exterior coating; 2mil blue urethane on interior.
- D. Rigid Nonmetallic Conduit: Schedule 40 PVC plastic, rated 90 degrees C. with glue-on PVC couplings and factory made elbows and sweeps; CARLON "PLUS 40".
- E. Flexible Conduit, Liquidtight: Flexible, galvanized steel with outer thermoplastic covering, "Sealtite" or equal. Provide liquidtight, insulated throat connectors.
- E. General Purpose Wireways and Auxiliary Gutters: Galvanized sheet steel with screw covers and ANSI-49 gray epoxy paint finish over a corrosion resistant phosphate primer. NEMA-1 for indoor use, NEMA-3R (raintight) for outdoor use.
- F. Conduit Bodies: Threaded type for use with GRS.
 - 1. For conduits 3-inch trade size and larger containing conductors larger than 250 kcmil provide Mogul type (NEC 6X8X Series) bodies.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Immediately upon delivery inspect products for damage and all other items as may be directed or recommended by manufacturer. Replace damaged or defective products before starting installation.
- B. Verify delivered products are of proper sizes and types and are in total compliance with approved Submittals and the Contract Specifications. Replace non-compliant products with approved products.

3.02 STORAGE AND HANDLING

- A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible.
- B. For exterior storage of fabricated products, place on sloped supports, above ground and protected from weather. Protect PVC conduit from direct exposure to sunlight.
- C. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.

3.03 INSTALLATION

- A. Install as shown on Contract Drawings, in compliance with the CEC, and following product manufacturer's installation instructions.
- B. Prior to installing product insure area is clean, free of obstructions and ready for acceptance of the product.
- C. Raceway Usage:
 - 1. Minimum permitted conduit size shall be $\frac{1}{2}$ inch trade diameter except provide minimum $\frac{3}{4}$ inch trade diameter for all underground runs, runs in or under concrete slabs, and runs in concrete and CMU walls.
 - 2. For conduit runs underground, in concrete or masonry block walls and under concrete slabs provide nonmetallic PVC 40 with PVC elbows and fittings. Where conduit transitions from underground or under slab to above grade provide wrapped rigid metal (GRS) elbows and risers. Where conduit rises from underground through concrete slabs on-grade and terminates directly in electrical equipment fastened to the on-grade slab, PVC elbows and risers may be used.
 - 3. For conduit runs exposed to the weather or harsh environments provide rigid steel conduit (GRS).
 - 4. Use PVC coated GRS as noted on the drawings.
 - 5. Flexible metal conduit shall be used only for the connection of motor connections and vibrating machinery unless otherwise specifically noted on the Drawings. Those for motors and vibrating machinery shall be "liquidtight" type.
- D. Metal conduit in contact with earth or concrete shall be wrapped with a corrosion-resisting protective tape covering equal to 3M Company Scotchwrap #51 tape (maximum one inch width for conduits up to and including 2" diameter). Wrapping shall be applied uniformly and tightly, free of voids and wrinkles, with a minimum one-half inch over-lap. Field joints shall be double wrapped and wrapping shall extend at least three (3) inches over adjacent conduit coverings.
- E. No electrical conduits shall be covered before inspection and approval by the Owner. Contractor shall notify Owner that conduits are ready for inspection at least 48 hours in advance of planned covering.
- F. Conduits shall be installed in a rigid and satisfactory manner with support spaced not more than 8 feet apart. Conduits shall be joined by approved conduit couplings and shall have ends butted in all cases where couplings are used. Conduits shall be tightly corked and otherwise well protected during construction and blown out and swabbed before wires are pulled. Ream all conduits ends after cutting. Bends shall be made with standard conduit elbows or conduit bent to not less than code compliant radius. All bends shall be free from dents or flattening. Conduits shall not be run in concrete slabs except where passing through vertically.

- G. Where conduits rise from underground locations or from under floors or concrete slabs, they shall do so vertically. No curved portion of the riser's elbow shall protrude beyond the finished surface of the floor, slab or other finished grade surface.
- H. Contractor shall provide all necessary sleeves and chases where conduits pass through floors and walls and any other necessary openings and spaces, all of which shall be arranged for in proper time to prevent unnecessary cutting. For opening or holes in structural members and footings see paragraph STRUCTURAL CONDITIONS of Section 16010. Where cutting is necessary, Contractor shall make all repairs in a manner satisfactory to the Owner's Representative.
- I. Straps and Hangers: Substantially support raceways by straps, suitable clamps or hangers to provide rigid installation.
1. Perforated strap hangers and twisted wire attachments not allowed.
 2. Do not support or fasten raceways to duct or pipe supports.
- J. Joints and Connections:
1. Metal conduits: Make threaded connections watertight in threaded conduit. Cut joints square, ream smooth, and properly thread.
 2. PVC conduits: Make couplings and connectors watertight in all runs. Utilize solvent cement of type approved by conduit manufacturer. Provide adapters and locknuts where conduit is attached to metal boxes and panels.
 3. Threads: Clean threads of rigid metal conduit. Coat male threads of steel conduit installed in concrete with red or white lead immediately before coupling together.
- K. Location Requirements:
1. Raceway runs shown on Drawings are diagrammatic unless specifically dimensioned. Determine exact locations of all undimensioned raceway runs in field.
- L. Install 3/16" polypropylene pull lines in all empty conduits of trade size 2" and larger.

END OF SECTION

**SECTION 16120
WIRE AND CABLE****PART 1 – GENERAL****1.01 SECTION INCLUDES**

- A. Requirements for wiring and cables for conveying electrical power between 50 volts and 600 volts.

1.02 RELATED SECTIONS

- A. Section 16010 Electrical General Requirements
- B. Section 16110 Raceways
- C. Section 16130 Boxes

1.03 SUBMITTALS

- A. Submit in accordance with Section 16010.
- B. Provide manufacturer's product data showing insulation type and conductor type.

PART 2 – PRODUCTS**2.01 CONDUCTORS**

- A. Individual Conductors: copper, with type THHN/THWN, 600 volt rated insulation and as follows:
 - 1. Conductors shall be minimum No. 12 AWG size.
- B. Wire color-code shall be as follows:

	<u>120/240V</u>	
A Phase ...	Black	
B Phase ...	Orange	(Stinger Leg)
C Phase ...	Blue	
Neutral ...	White	

 - 1. Ground wire insulation color shall be Green.
 - 2. For individual conductors larger than No. 6, insulation color may be black with 3M Co. Scotch 35, or equal, tape bands (colored per above) located at each end of the conductor run and at all other locations required by the C.E.C.
- C. All wire shall be brought to the job in unbroken packages and approved by the Owner before being installed.

PART 3 – EXECUTION**3.01 INSTALLATION**

- A. All wiring, including low-voltage wiring, shall be run in approved raceways unless otherwise specifically noted or approved.
- B. All wiring shall be done with identified (white) neutrals and color-coded phase wires.
- C. Feeders shall consist of individual conductors installed in conduit.
- D. All branch circuit conductors shall be continuous from outlet to outlet and no splice shall be made except within outlet, junction or pull boxes.
- E. Feeder conductors shall be continuous from equipment to equipment. Splices in feeder conductor runs are not permitted unless specifically noted on the Drawings or approved by the Electrical Engineer.
- F. Splices: Join the conductors securely, both mechanically and electrically using screw-on type connectors for wire sizes No. 6 AWG and smaller. The preferred product is Wire-Nut twist on connector by Ideal.
- G. Use high compression barrel splices for conductors larger than AWG #6. The preferred barrel splice is Burndy HYLINK splice. In all splicing cases the spliced area shall be covered to provide equal or greater insulation than that of adjoining conductors. New insulation over the original insulation shall extend 3 to 5 overall diameters of insulated wire. The preferred insulation product is Cold-Shrink by 3-M Company.
- H. The splice area shall be covered to provide equal or greater insulation than that of the adjoining conductors. Tape run-back over the original insulation shall extend 3 to 5 overall diameters of the insulated wire. Splices made in underground locations or damp locations to be wrapped with Scotch 33+ tape and coated with two (2) coats of Scotchkote, both as manufactured by 3M Company.
- I. All branch circuit wires in power pedestal shall be properly identified with linen tape. All wires shall be neatly formed and fastened with clips or lacings.

3.02 TESTING

- A. Test all wiring for continuity, short circuits, loose neutrals and improper grounds.
- B. Check all terminations for loose connections and verify connections properly torqued.

END OF SECTION

**SECTION 16130
BOXES****PART 1 – GENERAL****1.01 SECTION INCLUDES**

- A. Concrete boxes.

1.02 RELATED SECTIONS

- A. Section 16010 Basic Electrical Requirements.
- B. Section 16050 Basic Electrical Materials and Methods.
- C. Section 16110 Raceways.
- D. Section 16120 Wire and Cables.
- E. Section 16170 Grounding and Bonding.

1.03 REFERENCES

- A. Reference Standards: See Section 16010.

1.04 SUBMITTALS

- A. Submit product data in accordance with requirements of Section 16010.

PART 2- PRODUCTS**2.01 MATERIALS**

- A. Concrete Boxes
 - 1. Construction:
 - a. Reinforced concrete bodies and bases with features and sizes indicated on Drawings.
 - b. All lids to have hold-down bolts and be permanently labeled as to usage as noted on the Drawings.
 - c. All boxes shall have H-20 load rating where located in areas subject to vehicular traffic.
 - 2. Manufacturer: UTILITY VAULT models as shown or approved BROOKS or CHRISTY equal.

PART 3 – EXECUTION**3.01 EXAMINATION**

- A. Immediately upon delivery inspect products for damage, and all other items as may be directed or recommended by manufacturer. Replace damaged or defective products before starting installation.
- B. Verify delivered products are of proper sizes and types and are in total compliance with approved Submittals and the Contract Specifications. Replace non-compliant products with approved products.

3.02 STORAGE AND HANDLING

- A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible.
- B. Do not store metal boxes exposed to weather.

3.03 INSTALLATION

- A. Install as shown on Contract Drawings and in accordance with product manufacturer's installation instructions.
- B. Prior to installing product insure area is clear, free of obstructions and ready for acceptance of the product.
- C. Concrete Boxes
 - 1. Set level and flush with existing grade except that boxes located in non-traffic areas shall be installed with top one inch above adjacent grade.
 - 2. Over-excavate around sides and ends of boxes and backfill and tamp to prevent box movement after box is installed.

END OF SECTION

**SECTION 16170
GROUNDING AND BONDING**

PART 1 – GENERAL**1.01 SECTION INCLUDES**

- A. Grounding and bonding of electrical equipment and raceway systems.

1.02 RELATED SECTIONS

- A. Section 16010 Basic Electrical Requirements.
- B. Section 16050 Basic Electrical Materials and Methods.
- C. Section 16110 Raceways.
- D. Section 16120 Wire and Cable.

1.03 REFERENCES

- A. Reference standards:
 - 1. California Electrical Code (CEC).

PART 2 – PRODUCTS**2.01 MATERIALS**

- A. Ground Wires:
 - 1. 600 Volt and below: Insulated copper per Section 16120.
 - 2. Size: Not less than requirements for CEC of building electrical systems. Provide larger sizes than required by codes when noted on Drawings.
- B. Bolted Connections: Everdur hardware, bolts, and lock washers.
- C. Welded Connections: Either Erico Cadweld Process or Continental Industries Thermoweld Process.
- D. Compression Connections: Thomas & Betts Series 5300 fittings. Use manufacturer's specific instructions and tools for each connection.
- E. Ground Rods: Copper or copper-clad steel, minimum $\frac{3}{4}$ inch diameter. Provide minimum 8 foot long rods where direct buried (non-accessible) and minimum 10 foot long rods where installed in ground wells or other accessible locations. Insure minimum of 96" direct earth contact for each ground rod.

PART 3 – EXECUTION**3.01 GENERAL**

- A. Ground all electrical systems in accordance with CEC.

3.02 INSTALLATION

- A. Grounding System:
1. Make connections mechanically secure and electrically continuous.
 2. Clean contact surfaces of ground connections.
 3. Raceway Systems: Install metallic raceways mechanically and electrically secure at joints, boxes, cabinets, fittings, and equipment. At point of electrical service entrance, bond metallic raceways together with ground conductor and connect to system ground bus. Bond boxes as specified in this Section for equipment.
 4. Provide separate green equipment ground conductor in all electrical raceways to effectively ground panels, controls, motors, disconnect switches, and noncurrent carrying metallic enclosures. Use bonding jumpers, grounding bushings, lugs, buses, etc. Connect equipment ground to system ground. Use same size equipment ground conductors as phase conductors, up through No. 10 AWG unless otherwise noted. Use CEC Table 250-95 for conductor size with phase conductors No. 8 and larger except provide larger sizes when indicated on the Drawings.

3.03 FIELD QUALITY CONTROL

- A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.
- B. Measure ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment. Resistance shall not exceed 10 ohms.

END OF SECTION

**SECTION 16195
ELECTRICAL IDENTIFICATION**

PART 1 – GENERAL**1.01 SECTION INCLUDES**

- A. Nameplates and tape labels.
- B. Wire and cable markers.

1.02 RELATED SECTIONS

- A. Section 16010 Electrical General Requirements

PART 2 – PRODUCTS**2.01 MATERIALS**

- A. Nameplates: Engraved three layer laminated plastic, black letters on white background unless otherwise specified.
- B. Wire and Cable Markers: Cloth markers, split sleeve or tubing type.
- C. Permanent black marker.

PART 3 – EXECUTION**3.01 INSTALLATION**

- A. General:
 - 1. Degrease and clean surfaces to receive nameplates and tape labels.
 - 2. Install nameplates and tape labels parallel to equipment lines.
- B. Secure nameplates to equipment fronts using screws, rivets, or adhesive. Secure nameplate to inside face of recessed panelboard doors in finished locations.
 - 1. Embossed tape not allowed.
- C. Wire Identification: Provide wire markers on each conductor in power pedestal, pull boxes and junction boxes, and at load connection. Identify with branch circuit or feeder number for power circuits and with control wire number as indicated on schematic and interconnection diagrams for control wiring.

- D. Equipment Identification:
1. Provide nameplates identifying electrical distribution and control equipment and disconnects.
 2. Panelboards and Switchboards:
 - a. Use 1/4 inch to identify equipment designation.
 - b. Use 1/8 inch to identify voltage rating and source.
 - c. Individual circuit breakers in power pedestal, 1/8 inch to identify panel or equipment served.
 3. Individual circuit breakers, enclosed switches, and motor starters: 1/8 inch to identify load served.

END OF SECTION

**SECTION 16427
POWER PEDESTALS**

PART 1 – GENERAL**1.01 SECTION INCLUDES**

- A. Requirements for freestanding outdoor power pedestals rated 600V or less.

1.02 RELATED SECTIONS

- A. Section 16100 Electrical General Requirements.

1.03 APPLICABLE STANDARDS

- A. The standards listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only and the latest edition will apply.
- B. National Electrical Manufacturers Association (NEMA).
- C. National Fire Protection Association (NFPA) Publication:
 - 1. NFPA -70.....National Electrical Code, 2002.
- D. Underwriters Laboratories (UL)
 - 1. UL 489.....Circuit Breakers, Molded Case
 - 2. UL 508.....Pedestals

1.04 SUBMITTALS

- A. Submit product data for each pedestal in accordance with provisions of Section 16010.
- B. Product data shall show the following:
 - 1. Complete electrical ratings to include amperes and volts.
 - 2. Pedestal component arrangement.
 - 3. Outline drawings showing overall dimensions, weights, anchoring points and dimensioned conduit entry areas.
 - 4. One-line diagram.
 - 5. Bussing material and short circuit withstandability.

6. Circuit breaker ampere ratings (trip and frame size) and short circuit interrupting ratings.

1.05 TESTING

- A. Routine Factory Tests:
 1. Routine tests shall be made by the manufacturer on each pedestal to ensure that the design performance is maintained in production.
 2. Factory tests shall be in accordance with UL 508.

1.06 SERVICE CONDITIONS

- A. All pedestals shall be suitable for use in California Seismic Zone 4 area.

1.07 SPARE PARTS

- A. Finish paint: Total of one (1) pint of each finish color used on pedestal. Ship with pedestal.

PART 2 – PRODUCTS

2.01 MANUFACTURER

- A. Design as shown on drawings is based on TESCO products.
- B. Pre-approved products of other manufacturers may be proposed if in compliance with paragraph “substitutions” of Section 16100 and meets the requirements of the construction documents:

2.02 GENERAL REQUIREMENTS

- A. Free-standing, dead-front, totally enclosed, pedestal with non walk-in, front only access construction.
- B. Copper phase and neutral conductors and copper equipment ground conductor.

2.03 GENERAL CONSTRUCTION

- A. Pedestal shall have section arrangements, voltage and ampere ratings and devices as shown on Drawings. As called for on the project drawings the pedestal line-up shall contain utility metering and main circuit breaker section, manual or automatic transfer switch, motor starters, and controls, see Electrical Specification sections which detail requirements for integral device and equipment.
- B. Motor controls (starter overloads, etc.) shall be the product of Cutler-Hammer or Square D and shall be as described on the project drawings.

- C. Pedestal sections shall be rear and rear aligned and connected with all incoming and outgoing connections made from the front.
- D. Pedestal shall be free standing, dead front, all 304 stainless steel, and totally enclosed. Construction shall be NEMA 3R, for outdoor use and shall have open space in bottom for bottom entry conduits.
- E. Pedestal shall consist of the required number of vertical sections bolted together to form one-piece construction.
- F. Pedestal shall include all protective devices and equipment together with necessary interconnections, instrumentation and control wiring.
- G. The pedestal shall not exceed the maximum dimensions shown on the Drawings.
- H. Provide adequate lifting means and be capable of being rolled or moved into installation position and bolted directly to the floor without the use of floor sills.
- I. Pedestals shall be constructed in accordance with NEMA and UL 508 standards.
- J. Pedestal interior conductors shall be copper.
- K. Neutral conductors shall have 100 percent capacity.
- L. A copper ground conductor shall be furnished firmly secured to each vertical section structure and shall extend the entire length of the pedestal. It shall have an ampacity not less than 25 percent of the rating of the main bus.
- M. Pedestal utility service entrance and all utility metering facilities and provisions shall conform to EUSERC standards and be PG&E approved. Landing lugs for service entrance conductors shall meet PG&E requirements and shall be furnished with the pedestal. Electrical Contractor shall obtain pedestal shop drawings from the pedestal manufacture and review the shop drawings with PG&E service representative. Electrical Contractor shall obtain written approval of shop drawings from PG&E prior to purchase of pedestal.

2.04 CIRCUIT BREAKERS

- A. Circuit breakers shall be 80% rated, molded case, thermal-magnetic type with adjustable magnetic trip unless otherwise noted on Drawings.
- B. Provide breakers of trip amps, number of poles and minimum interrupting capacities specified.
- C. Breakers shall have distinct On-Tripped-Off positions. Trip mechanism shall operate all poles of multiple devices simultaneously during open, close, and trip operations.

2.05 TERMINATIONS

- A. Pedestal incoming main lugs shall be sized to accommodate the required quantity and sizes of cables specified.
- B. All lugs for terminating cables shall be copper.
- C. Landing lugs shall be provided with the pedestal.

2.06 PAINTING

- A. Pedestals shall have manufacturer's City approved battleship grey finish color. Submit paint chip for City approval prior to painting. Finish shall be electrostatically applied dry polyester powder coating bake cured. Field painting of product is not permitted except for application of touch-up work on damaged surfaces.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Immediately upon delivery inspect equipment for damage, loose mechanical and electrical connections, and all other items as may be directed or recommended by manufacturer. Replace damaged or defective products before starting installation.
- B. Verify delivered equipment is of proper ratings and in total compliance with approved Submittals and the Contract Specifications. Replace non-compliant products with approved products.

3.02 STORAGE AND HANDLING

- A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate controlled enclosures.
- B. Do not store products exposed to weather.
- C. Provide off-site storage and protection when site does not permit on-site storage protection.
- D. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.
- E. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.
- F. Transport and handle products in accordance with manufacturer's instructions.

- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

3.03 INSTALLATION

- A. Install as shown on Contract Drawings and in accordance with product manufacturer's installation instructions.
- B. Prior to installing product insure area is clean, free of obstructions and ready for acceptance of the product.
- C. Install pedestals level and plumb and with clearances in accordance with CEC. Anchor pedestal in accordance with the Drawings and California UBC requirements for Seismic Zone 4.
- D. Torque all bolted connections per manufacturer's instructions.
- E. Neatly arrange field installed cabling within pedestal enclosure. Radius of cable bends shall not be less cable manufacturer's recommended radii and in no case less than CEC minimums.
- F. Prior to energizing equipment verify all components are properly connected, free from shorts and unintentional grounds and neutral is properly grounded.
- G. Initial energization of pedestal shall be done with all circuit breakers in the open (off) position.

3.04 TESTS

- A. Test all components for proper operation. Verify correct voltages.
- B. Manually close and open each circuit breaker. Adjust magnetic trip settings on breakers equipped with adjustable magnetic trip.

END OF SECTION

SECTION 16600**EMERGENCY POWER SYSTEMS****PART 1 – GENERAL****1.01 DESCRIPTION**

- A. General requirements for work related to the provision and installation of emergency power equipment and systems described elsewhere in these Specifications.

1.02 DEFINITIONS

- A. For the work of this Contract “Emergency Power Systems” shall mean:
 - 1. Engine-Generator Sets and Accessories.
 - 2. Engine-Generator Set Weatherproof Sound Enclosure.
 - 3. Automatic and Manual Transfer Switches and Accessories.

1.03 RELATED SECTIONS

- A. Section 16010 Electrical General Requirements.
- B. Section 16050 Basic Electrical Materials and Methods.
- C. Section 16630 Engine-Generator Sets.
- D. Section 16635 Automatic Transfer Switches.

1.04 SCOPE OF WORK

- A. Provide, install and acceptance test complete and operable automatic, standby Emergency Power Systems, including related accessories and electrical interconnections. See project Drawings.

1.05 QUALITY ASSURANCE

- A. Suppliers of Emergency Power System equipment shall be the equipment manufacturer's authorized distributors and shall have 24-hour service availability and factory-trained service technicians authorized to do warranty service on all warrantable products of the manufacturers.

- B. Ensure completion of factory tests on the equipment to be shipped to this project. Provide copies of manufacturers certified test reports to Engineer (1) and owner (2).
- C. Install equipment in strict accordance with manufacturer's installation instructions. Make final connection to equipment under supervision of manufacturer's authorized representative.

1.06 SUBMITTALS

- A. Provide submittals for Automatic Transfer Switch, Generator and Enclosure.
- B. Submit in accordance with Section 16010.
- C. As a minimum submittal shall include the following:
 - 1. Specification and data sheets.
 - 2. Shop drawings showing component layouts, certified overall dimensions, required access clearances, weights, and anchoring points and dimensioned center of gravity point.
 - 3. Wiring diagrams. Include all required external connections with field wiring terminals marked in a consistent point-to-point manner.
 - 5. Manufacturer's installation instructions.
 - 6. Manufacturer's published warranty documents.
 - 7. Manufacturer's recommended spare parts list.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver Emergency Power System equipment to site only after the areas in which they are to be installed are ready to receive them in their place of final installation.
- B. Fully protect equipment from damage and the elements.

1.08 WARRANTY

- A. Except as otherwise specified provide warranties in accordance with Section 16010.

PART 2 – PRODUCTS

2.01 APPROVED MANUFACTURERS

- A. Acceptable manufacturers are specified in Sections 16630 and 16635.
- B. Equal products furnished by other manufacturers will be considered on a pre-approval basis.

2.02 PRODUCT DIMENSIONS

- A. Overall dimensions of Emergency Power System equipment when shown on the Drawings are for planning purposes. Exact dimensions shall be provided with product submittal.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. All work shall be performed by skilled tradesmen with minimum of five (5) years experience in the installation of emergency power systems equivalent in size and scope to the work of this Contract.
- B. Install work in full accordance with all applicable codes and manufacturer's directives.
- C. Coordinate with trades providing equipment pad for the engine-generator set to ensure that the pad is adequately sized and engineered to properly support the engine-generator set in accordance with manufacturer's recommendations and California UBC requirements.

3.02 ADJUSTMENT, CLEANING, FINISHING AND PROTECTION

- A. Repair damaged and defective work wherever possible to eliminate defects; where not possible to repair, replace.
- B. Make all final adjustments to equipment per manufacturer's instruction and under manufacturer's authorized representative's direction.
- C. Clean all equipment surfaces. Touch-up shop-applied finishes to restore damaged areas.
- D. Protect and maintain protections to ensure work will be without damage or deterioration at time of acceptance.

3.03 ACCEPTANCE TESTING

- A. Upon completion of all work including engine-generator set initial start-up, the complete emergency power system shall be tested to show proper operation and compliance with the Specifications. The testing shall be done in two stages:

Initial and Final. The time (day and hour) of the Final test shall be as directed by the Owner.

- B. Testing shall be conducted by representatives of the equipment manufacturers. Required fuel for testing shall be supplied by Contractor.
- C. Testing shall be witnessed by representatives of the Contractor, Engineer and Owner. Provide all parties with notice of time of test at least 48 hours in advance of the test.
- D. Initial portion of the acceptance test shall consist of the following stages which are to be performed in sequence and using a resistive load bank:
 - 1. Cold Start Test.
 - 2. Operation at 25%, 50% and 75% rated load for one-half (1/2) hour at each level.
 - 3. Continuous operation at full rated load for one-half (1/2) hour.
- E. Final acceptance test shall demonstrate the systems automatic operation and automatic retransfer of load from emergency to normal power:
 - 1. Simulation of utility (normal) power failure by opening of the main breaker at the main switchboard.
 - 2. Automatic start-up, load transfer and operation of the existing facility on generator power for a minimum of one-half (1/2) hour.
 - 3. Simulation of return of normal utility power by re-closure of the main breaker; automatic retransfer of load from emergency to normal power; automatic cool-down and shutdown procedures to occur.
 - 4. Demonstrate that SCADA signal is sent to SCADA transmitter and is received by the Owner's SCADA monitoring system.
- F. Failures, malfunctions, incorrect operation or other problems which occur or otherwise become apparent during Acceptance Testing shall:
 - 1. Cause immediate termination of the test being conducted, unless otherwise approved by the Engineer.
 - 2. Be corrected to the satisfaction of the Engineer and Owner.

After corrections have been satisfactorily completed, testing shall be repeated in its entirety at no cost to the Owner.

3.04 TRAINING

- A. Contractor shall arrange for and provide training of Owner's personnel in the proper operation and routine maintenance of the Emergency Power System.
- B. The training shall be conducted by the manufacturer's authorized representatives.

3.05 OPERATIONS AND MAINTENANCE MANUALS

- A. Provide in accordance with Sections 16630 and 16635 and in conformance with Division 1.

END OF SECTION

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SECTION 16630**ENGINE-GENERATOR SET****PART 1 – GENERAL****1.01 SECTION INCLUDES**

- A. Requirements for outdoor AC emergency/standby power, diesel-electric engine-generator sets.

1.02 RELATED SECTIONS

- A. Section 16010 Electrical General Requirements.
- B. Section 16050 Basic Electrical Materials and Methods.
- C. Section 16600 Emergency Power Systems.
- D. Section 16635 Automatic Transfer Switches.

1.03 SPECIAL CONDITIONS

- A. Engine-Generator Set will be furnished by the Contractor.
- B. Contractor will be responsible for installation, connection, testing and adjusting equipment.

1.04 SUBMITTALS

- A. Product Data in accordance with Section 16600.
- B. Submit shop drawings and calculations for the engine-generator set anchorage. Anchorage shall meet the requirements for seismic installation per California Building Code.
- C. Contractor shall coordinate with the Air Quality Management District (AQMD) for installation of generators. Be responsible for all permitting and other requirements necessary for installation and operation of new generators. The Owner shall be responsible for costs (fees, etc.) associated with this work.

PART 2 – PRODUCTS

The engine-generator set and the sound enclosure will be located in an area of extreme varying environmental conditions.

- 1. Paint finishes shall have minimum pencil hardness of HB and a corrosion or adhesion loss not to exceed 1/8 inch average width from a scribe mark

after a minimum exposure to 500 hours of salt spray per ASTM-B117. Submit documentation that paint finishes meet this specification or equal.

2. The equipment shall be thoroughly cleaned and painted with at least one coat corrosion inhibiting primer and at least two finish coats to give a minimum total dry film thickness of no less than 3 mils.
3. The finish coats shall be standard manufacturer color.

2.01 MANUFACTURERS

- A. Equipment shall be manufactured in an ISO 9001 compliant facility.
- B. Equipment, documentation and services described in this Section are based upon the Kohler 40REOZK4 product. Equal products furnished by Caterpillar, Generac or other equal manufactures will be considered.

2.02 GENERAL REQUIREMENTS

- A. Diesel fuel powered engine-generator set with brushless generator, permanent magnet excitation, 3-phase RMS sensing automatic voltage regulator, and set-mounted control panel.
- B. Generator set shall have power rating as shown on the Drawings with 0.8PF, standby rating at a system voltage as shown on the Drawings at 60 Hertz.
- C. Equipment shall be suitable for operating under the environment conditions listed in Section 16010.

2.03 PERFORMANCE

- A. Voltage regulation shall be less than $\pm 0.5\%$ of rated voltage at steady state, and less than ± 1.0 per cent of rated voltage no load to full load.
- B. Less than 5% waveform deviation.
- C. Generator TIF less than 50 and THD less than 5%.
- D. The engine-generator set shall be capable of single step load pick up of 100% nameplate kW and power factor, less applicable derating factors, with the engine-generator set at operating temperature.
- E. Motor starting capability shall be in excess of 1.95kVA per continuous kW. The generator set shall be capable of sustaining a minimum of 90% of rated no load voltage with the specified kVA load at near zero power factor applied to the generator.
- F. Engine-generator set vendor shall provide a generator set that will start and power the connected load. Submit a computer generated load analysis which demonstrates the generator will start and operate the connected load.

2.04 AC GENERATOR

- A. The AC generator shall be synchronous, four pole, rotating field, drip proof construction, single pre-lubricated sealed bearing, air cooled by a direct drive centrifugal blower fan, and directly connected to the engine with flexible drive disc(s).
- B. All insulation system components shall meet NEMA MG1 temperature limits for Class H insulation system. Actual temperature rise measured by resistance method at full load shall not exceed 150 degrees Centigrade.
- C. Skewed stator and 2/3 pitch windings. Dynamically balanced rotor assembly with amortisseur (damper) windings.
- D. The generator shall be broad range, 12 lead re-connectable. The generator shall be capable of delivering rated output (kVA) at rated frequency and power factor, at any voltage within the broad range.
- E. A permanent magnet generator (PMG) shall provide excitation power for immunity from voltage distortion caused by non-linear loads. The PMG shall sustain excitation power for optimum motor starting and to sustain short circuit current at approximately 300% of rated current for not more than 10 seconds.
- F. The automatic voltage regulator shall be temperature compensated solid-state design. The voltage regulator shall be equipped with RMS sensing. The regulator shall control buildup of AC generator voltage to provide a linear rise and limit overshoot. The regulator shall include a torque-matching characteristic, which shall reduce output voltage in proportion to frequency below a threshold of 58 Hz. The torque-matching characteristic shall use differential rate of frequency change compensation to use the maximum available engine torque and provide optimal transient load response. Regulators which use a straight-line fixed volts per hertz characteristic are not acceptable.

2.05 ENGINE-GENERATOR SET CONTROLS

- A. Control panel shall be electronic, microprocessor-based. Panel shall provide:
 - 1. Automatic/manual start-stop engine control with programmable safety shutdowns and flashing LED indicators for:
 - a. Low oil pressure.
 - b. High coolant temperature
 - c. Overspeed
 - d. Overcrank
 - e. Emergency stop
 - 2. Adjustable, 1 – 60 second crank/rest periods.
 - 3. Adjustable 0 – 30 minute cool down timer.
 - 4. LCD digital readouts for:

- a. Oil pressure
 - b. Coolant temperature
 - c. Engine RPM
 - d. System DC volts
 - e. Engine running hours
 - f. Generator AC volts, amps and frequency
5. Ammeter – voltmeter phase select switch.
 6. Emergency stop pushbutton.
 7. Indicator/display test switch.
 8. Voltage adjust potentiometer
- B. The control shall have automatic remote start capability from a panel-mounted 3-position (Stop, Run, Remote) switch. Provide cycle cranking of 15 SEC (ON)/15 SEC (OFF) for three attempts (75 SEC). If engine fails to start lockout the engine and indicate overcrank on alarm status panel.
- C. The control shall shut down and lock out upon: failing to start (overcrank), overspeed, low lubricating oil pressure, high engine temperature, or operation of a remote manual stop station.
- D. The control panel shall be mounted on the right side of the generator set with vibration isolators. A front control panel illumination lamp with ON/OFF switch shall be provided.

2.06 ENGINE

- A. The engine shall be diesel fuel powered 4 cycle turbocharged, 1800 RPM, radiator and fan cooled. Two cycle engines are not acceptable.
- B. An electronic governor shall provide automatic frequency regulation adjustable from isochronous to 5% droop. The governor shall have provision for paralleling with the addition of load sharing controls.
- C. The engine shall be cooled by a mounted closed loop radiator system rated for full load operation in 122 degrees F (50 degrees C) ambient as measured at the generator air inlet. Radiators shall be provided with a duct adapter flange. The cooling system shall be filled with 50/50 ethylene glycol/water mixture by the equipment SUPPLIER. Rotating parts shall be guarded against accidental contact.

2.07 ENGINE ACCESSORY EQUIPMENT

- A. An electric starter capable of three complete cranking cycles without overheating, before overcrank shutdown (75 seconds).

- B. Positive displacement, mechanical, full pressure, lubrication oil pump. Full flow lubrication oil filters with replaceable spin-on canister elements and dipstick oil level indicator.
- C. An engine driven, mechanical, positive displacement fuel pump. Fuel filter with replaceable spin-on canister element. Replaceable dry element air cleaner with restriction indicator.
- D. Engine mounted battery charging alternator, 45 ampere minimum, and solid-state voltage regulator.

2.08 BASE

- A. The engine-generator set shall be mounted on a heavy duty steel base to maintain alignment between components. The base shall incorporate a battery tray with hold down clamps, within the rails.

2.09 AUXILIARY EQUIPMENT AND ACCESSORIES

- A. Coolant heater: Engine mounted, thermostatically controlled, water jacket heater(s) sized as recommended by the engine manufacturer. Heater voltage shall be 120 volts.
- B. Starting and Control Batteries: Starting batteries, lead acid type, 24 volt DC, sized as recommended by the engine manufacturer, and complete with battery cables and connectors.
- C. Battery Charger: Provide voltage regulated battery charger. Input AC voltage shall be 120VAC and DC output voltage shall be as required. Charger shall be equipped with float, taper and equalize charge settings. Operational monitors shall provide visual output along with individual form C contacts rated at 4 amps, 120 VAC, 30 VDC for remote indication of:
 - 1. Loss of AC power
 - 2. Low battery voltage
 - 3. High battery voltage
 - 4. Power ON - green light (no relay contact).
- D. Exhaust system shall be installed according to the generator set manufacturer's recommendations and applicable codes and standards.
- E. Provide a weatherproof sound enclosure with manufacturer standard finish paint color. See Specification Section 16630 above for paint requirements. Maximum sound level (8 position average) shall be 68 dbA. The noted dbA number represents maximum sound level at full load 60Hz, at 7 meter (23 ft) in a free field. The enclosure shall be 14 gauge steel (minimum); have safety glass control panel viewing window; externally mounted emergency stop button; stainless steel hinges, locks, and hardware; radiator sight gauge; lockable

gasketed doors; exhaust silencing system critical grade housed within the enclosure; interior lighting system.

- F. Generator output breaker ampere rating as shown on the Drawings, thermal-magnetic type in NEMA 1 enclosure, mounted on left-hand side of generator. Breaker load side cabling will exit at bottom of enclosure.
- G. Auxiliary contacts for SCADA signaling, one set of normally open contacts which close upon generator running; one set of normally open contacts which close upon generator trouble or generator failure.

2.10 FUEL SUPPLY

- A. Diesel fuel shall be stored in a standard sized skid mounted, double walled, leak monitored storage tank, furnished with engine-generator set. The tank shall be sized to operate the generator at 100% load for a minimum 24 hours without refueling.
- B. Fuel tank shall meet the requirements of NFPA 30 and UL-142, and be approved by the local fire marshal, and shall meet all requirements of the Environmental Health Department.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install engine-generator set as shown on the Drawings and in accordance with the manufacturer's instructions.
- B. Contractor shall coordinate with engine-generator Supplier, an authorized manufacturer's representative to provide:
 - 1. Periodic inspection and assistance during installation to insure conformance with manufacturer's installation instructions. Minimum of three inspections during installation.
 - 2. Initial start-up work by Manufacturer's Representative.
 - 3. Acceptance tests by Manufacturer's Representative. Provide written documentation of Manufacturer's acceptance of generator set installation.
- C. Appropriate flexible lines shall be used for connecting fuel supply and return piping to the engine-generator set.
- D. Point to point power cable and control wiring and terminations shall be performed by the Contractor.

3.02 EQUIPMENT ANCHORAGE

- A. Engine-generator set shall be attached to the concrete pad in accordance with the Drawings and the approved engine-generator set anchorage submittal.
- B. The entire concrete anchoring system shall be designed as recommended by the engine-generator set manufacturer. Anchorage shall meet the requirements for seismic installation per California Building Code. Do not install equipment without Engineer's acceptance of anchoring details.

3.03 TESTS

- A. Perform on-site acceptance tests in accordance with requirements of Section 16600 and paragraph 3.1B above.

END OF SECTION

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SECTION 16635**AUTOMATIC TRANSFER SWITCHES****PART 1 – GENERAL****1.01 SECTION INCLUDES**

- A. Requirements for automatic transfer switches.

1.02 RELATED DOCUMENTS

- A. Section 16010 Electrical General Requirements.
- B. Section 16050 Basic Electrical Materials and Methods.
- C. Section 16600 Emergency Power Systems.
- D. Section 16630 Engine Generator Sets.

1.03 QUALITY ASSURANCE

- A. Products shall be constructed in accordance with applicable requirements of UL 891, UL 1008 and NEMA ICS-2-447.
- B. Products shall be factory tested before shipment to job-site.

1.04 SUBMITTALS

- A. Provide in accordance with Section 16600.

1.05 WARRANTY

- A. Provide in accordance with Sections 16010 and 16600.

PART 2 – PRODUCTS**2.01 MANUFACTURER**

- A. Equipment described in this Section and shown on the Drawings is based on ASCO Power Transfer Switches.

2.02 GENERAL REQUIREMENTS

- A. Transfer switches shall be compatible with engine-generator set.
- B. Dead front, totally enclosed, front accessible. Minimum 12 gauge formed steel frame construction. Provide NEMA 3R for outdoor installation.
- C. All bussing copper.

- D. Amp, Voltage and Phase ratings as shown on the Drawings
- E. Minimum withstand ratings as shown on the Drawings when used with molded case, thermal-magnetic circuit breakers.

2.03 AUTOMATIC TRANSFER SWITCH (ATS)

- A. Microprocessor controlled. Provide 3 pole switches with solid neutral.
- B. Electrically-operated, mechanically held main transfer switch element with momentarily energized single-solenoid electrode operator. Maximum transfer operating time shall be one-sixth (1/6) second. Switch shall be mechanically interlocked to ensure only one of two possible positions: normal or emergency.
- C. All main contacts shall be silver composition.
- D. Provide capability to manually switch source.

2.04 ATS CONTROL

- A. Three-phase, solid-state, microprocessor control module completely enclosed in a protective cover. Interfacing relays industrial grade plug-in type with dust covers.
- B. True RMS voltage sensing of all phase of normal source. Pickup voltage adjustable from 85% to 100% of nominal, factory set at 90%. Dropout voltage adjustable from 75% to 98% of nominal, factory set at 85%.
- C. Three phase voltage sensing of emergency source. Pickup voltage adjustable from 85% to 100% of nominal, factory set at 90%. Dropout fixed at 84 to 86% of pickup.
- D. In-phase algorithm which automatically measures the frequency difference between the two sources and initiates transfer to normal at appropriate phase angles.
- E. All adjustable pickup and dropout settings fully adjustable in 1% increments and have $\pm 2\%$ or better repetitive accuracy over a -20C to +70C operating temperature range.
- F. Provide fully field-adjustable time delays as follows:
 - 1. Time delay on engine start (TDES): 0 to 6 seconds, factory set at 1 (one) second.
 - 2. Transfer to emergency (TDE): 0 to 60 minutes, factory set at 10 seconds.
 - 3. Retransfer to normal (TDN): 0 to 60 minutes, factory set at 5 (five) minutes.

4. Unloaded running time delay for engine cooldown: 0 to 60 minutes, factory set at 5 minutes unless otherwise instructed by the engine-generator set manufacturer.

2.05 ADDITIONAL CONTROLS AND DEVICES

- A. Engine start contacts, 10 Amp 32VDC rated, close on normal source failure.
- B. Momentary test-switch, mounted on ATS door, to simulate normal source failure.
- C. "Commit/no commit to transfer" switch.
- D. Auxiliary contacts rated 10 Amps 240VAC: three contacts closed when ATS in "normal" position and three contacts closed when ATS in "emergency" position and two contacts closed upon loss of normal power
- E. Pilot lights shall be provided on front of ATS to indicate availability of normal and emergency power sources and ATS in normal or emergency position.
- F. Statistical ATS/system monitoring data screens.

PART 3 – EXECUTION

3.01 STORAGE

- A. Store in accordance with Section 16600.

3.02 PREPARATION

- A. Ensure equipment space is clean and ready for installation of the transfer switches.
- B. Have on hand adequate personnel, tools and equipment required for setting equipment in place so as not to delay the installation.
- C. Provide adequate safeguards and barriers to keep all unauthorized persons including general public safely away from the installation work.

3.03 INSTALLATION

- A. Locate as shown on the Drawings.
- B. Installation shall comply with all applicable local and state codes.
- C. Install equipment in accordance with manufacturer's instructions and the instructions included in the listing or labeling of UL listed products.
- D. Install source and load cables to equipment and make connections. Cables within equipment shall be secured per equipment manufacturer's instructions to withstand fault currents. Torque all cable lugs to manufacturer's specifications.

3.04 EQUIPMENT ANCHORAGE

- A. Anchor equipment to resist seismic zone 4 forces.

3.05 TESTS

- A. Transfer switches shall be factory tested before shipment. Tests shall include a complete functional test of all operations and controls including calibration of voltage sensors and setting of time delays.
- B. Perform on-site acceptance tests in accordance with requirements of Section 16600.

END OF SECTION