SPECIFICATION and CONTRACT DOCUMENTS

FOR

CONSTRUCTION OF PUMP STATION
EAST MAIN AVENUE WELL #1
PROJECT

CITY OF MORGAN HILL

MORGAN HILL, CALIFORNIA
PUBLIC WORKS DEPARTMENT

PREPARED BY

PUBLIC WORKS DEPARTMENT

JUNE, 2017

NOTICE INVITING BIDS

1. **Bid Acceptance.** The City of Morgan Hill ("City"), will accept sealed bids for its Construction of Pump Station East Main Avenue Well #1 Project ("Project"), by or before **Thursday, July 13, 2017, at 2:30 p.m.**, at its Development Services Center's 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 site is located at the following location:

- Main Avenue Well #1 site is located at 615 East Main Avenue, Morgan Hill, CA 95037.

The Project's Scope of Work is described as follows:

- Furnishing all materials, labor, equipment, fuel, tools, and transportation required to:
    - Clear, grub, and grade site for new pump station;
    - Furnish and install new water pipelines and all trenching, backfill and compaction;
    - Construct new pump pedestal and furnish and install one (1) 60-hp (horsepower) vertical turbine well pump, suction pipe, discharge head and variable speed motor assembly and all other related pump work;
    - Construct building foundation, masonry block building, roof, doors, access hatch, and all other building appurtenances;
    - Furnish and install all electrical systems;
    - Install PG&E electrical service conduits, including transformer pad,
    - Furnish and install fire suppression system;
    - Furnish and install landscaping, irrigation and all site work, including paver driveway;
    - Perform all performance testing, disinfecting, clean up and provide operation manuals;
    - Complete all other required work related to the above items as shown on the Plans and as detailed in these Specifications to construct a fully operation well pump station.

2.2 Time for Completion. The planned timeframe for commencement and completion of construction of the Project is: 180 calendar days from the Notice to Proceed date.

3. License and Registration Requirements.

3.1 License. This Project requires a valid California contractor's license for the following classification(s): A or B.

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. **Bidders' Conference.** No bidders' conference will be held. Site is accessible from Main Avenue.

12. **Estimated Cost.** The estimated construction cost is $1.28 Million.

By: Irma Torrez, City Clerk Date: June 14, 2017

Publication Dates: 1) June 23, 2017 2) June 30, 2017

END OF NOTICE INVITING BIDS

INSTRUCTIONS TO BIDDERS

Each Bid Proposal submitted to the City of Morgan Hill ("City") for its Construction of Pump Station East Main Avenue Well #1 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
Boys Ranch Well #2A and Jackson Well #3 Well Pump Stations Project
City of Morgan Hill
17575 Peak Avenue
Morgan Hill, CA 95037
Attention: Bid Opening/RFP
Bid Date: Wednesday, April 19, 2017
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 David Gittleson at david.gittleson@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, and may also submit a Bid Proposal as a prime contractor.

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

East Main Avenue Well #1 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. 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 SCHEDULE I – GENERAL

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).

Bid Item	Description of Bid Item	Approx. Quantity	Unit	Unit Price	Extended Total
1	Mobilization	1	LS	$	$
2	Project Records and Submittals	1	LS	$	$
3	Temporary Barrier Fencing	1	LS	$	$
4	Preservation and Cleanup	1	LS	$	$
5	Project Close-out	1	LS	$	$
6	Demolition, Clearing, Grubbing & Stripping	1	LS	$	$
7	Earthwork	1	LS	$	$
8	Paving	1	LS	$	$
9	Interlocking Paving Stones	1	LS	$	$
10	Chain Link Fencing	1	LS	$	$
11	Concrete	1	LS	$	$
12	Concrete Masonry Units	1	LS	$	$
13	Metal Doors & Frames	1	LS	$	$
14	Painting	1	LS	$	$
15	Building	1	LS	$	$
16	Signs and Safety Equipment	1	LS	$	$
17	Pipe (Station, Distribution, and Drainage)	1	LS	$	$
18	Valves and Related Appurtenances	1	LS	$	$
19	Vertical Turbine Components	1	LS	$	$
20	Chemical Treatment System	1	LS	$	$

21	Disinfection of Wells, Pumps, and Piping	1	LS	$	$
22	Fire Protection System	1	LS	$	$
23	Ventilation	1	LS	$	$
24	Performance Testing and Facility Startup	1	LS	$	$
25	Electrical	1	LS	$	$
26	Electrical Controls (MMC, Controller and Radio)	1	LS	$	$
27	Landscaping	1	LS	$	$
28	Supplemental	1	LS	$25,000	$25,000
Bid Schedule I Total (Items 1 – 28):				**$**	

Abbreviations:
CY: Cubic Yard, HR: Hour, LF: Linear Feet, LS: Lump Sum

END OF BID SCHEDULE

SUBCONTRACTOR LIST

For each Subcontractor who will perform a portion of the Work in an amount in excess of one-half of 1% of the Bidder's total Contract Price,[1] the bidder must list a description of the work, the name of the Subcontractor, its California contractor license number, the location of its place of business, and DIR registration number. **Bidders: Please print legibly. Illegible forms may be rejected.**

DESCRIPTION OF WORK	SUBCONTRACTOR NAME	CALIFORNIA CONTRACTOR LICENSE NUMBER	DIR REG. NO.	LOCATION OF BUSINESS	LOCAL VENDOR[2] YES/NO

END OF SUBCONTRACTOR LIST

[1] For street or highway construction this requirement applies to any subcontract of $10,000 or more.
[2] A Subcontractor is considered local if its principle place of business is within the city limits of Morgan Hill.

NONCOLLUSION DECLARATION

(To be executed by bidder and submitted with bid)

State of California County of _____	)))	ss.

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]

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT CIVIL CODE ' 1189

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document, to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of **CALIFORNIA**)

County of SANTA CLARA)

On _____, before me, _____

a Notary Public in and for said County and State, personally appeared

_____

_____

proved to me on the basis of satisfactory evidence to be the person/s whose name/s is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity/ies, and that by his/her/their signature/s on the instrument the person/s, or the entity upon behalf of which the person/s acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

_____

SIGNATURE OF NOTARY PUBLIC

Place Notary Seal Above

BID BOND

_____ ("Bidder") has submitted a bid, dated _____, 20_____ ("Bid"), to the City of Morgan Hill ("City") for work on the **East** Main Avenue Well #1 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: _____

BIDDER'S QUESTIONNAIRE

East Main Avenue Well #1 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 <u>each</u> 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 East Main Avenue Well #1 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: David Gittleson
Email: david.gittleson@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:

_____
Steve Rymer
City Manager

Date: _____

Attest:

_____
Michelle Wilson
Deputy City Clerk

_____

Date: _____

Approved as to Form:

_____
Donald A. Larkin
City Attorney

Date: _____

CONTRACTOR:

_____

_____
Name/Title [print]

Date: _____

Corporate entities must provide a second signature:

_____

_____

Name/Title [print]

Date: _____

_____
Contractor's License Number(s)

_____
Expiration Date(s)

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 East Main Avenue Well #1 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__. Three (3) identical counterparts of this Bond, each of which is deemed an original for all purposes, are hereby executed and submitted.

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 PAYMENT BOND

PERFORMANCE BOND

The City of Morgan Hill ("City") and _____ ("Contractor") have entered into a contract, dated _____, 20____ ("Contract") for work on the East Main Avenue Well #1 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___. Three (3) identical counterparts of this Bond, each of which is deemed an original for all purposes, are hereby executed and submitted.

[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 East Main Avenue Well #1 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 $_____) or 50% of the final Contract Price, whichever is greater ("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__. Five (5) identical counterparts of this Bond, each of which is deemed an original for all purposes, are hereby executed and submitted.

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 WARRANTY BOND

GENERAL CONDITIONS

Table of Contents:

Article 1 – Definitions 1
Article 2 – Roles and Responsibilities 5
Article 3 – Contract Documents 9
Article 4 – Bonds, Indemnity and Insurance 11
Article 5 – Contract Time 16
Article 6 – Contract Modification 21
Article 7 – General Construction Provisions 24
Article 8 – Payment 32
Article 9 – Labor Provisions 37
Article 10 – Safety Provisions 39
Article 11 – Completion and Warranty Provisions 40
Article 12 – Dispute Resolution 43
Article 13 – Suspension and Termination 48
Article 14 – Miscellaneous Provisions 50

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 delegee(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 "Indemnitee," 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) for bodily injury or death to any one person for any one accident or occurrence and at least Two Million Dollars ($2,000,000.00) for property damage, 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) **Builder's Risk Insurance***:* The Builder's Risk Insurance policy must be issued on occurrence basis, for all-risk coverage on a one hundred percent (100%) completed value basis on the insurable portion of the Project for the benefit of City.

(3) **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.

(4) **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) for bodily injury or death to any one person for any one accident or occurrence and at least One Million Dollars ($1,000,000.00) for property damage, 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) **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.

(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 full 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

East Main Avenue Well #1 Project

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: $_____
   (before retention)

7. 5% RETENTION FROM WORK DONE: (-)$_____

8. CURRENT BALANCE DUE: (6-7) $_____

9. REMAINING BALANCE OF REVISED CONTRACT AMOUNT: (5-8) $_____
   (including retention)

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.

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 mutal 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

1.0 Shop Drawings. Whenever Shop Drawings are required by the Contract Documents or by the Engineer, Contractor must submit five (5) prints of each shop drawing to the Engineer.

(A) If three (3) prints of the drawing are returned to Contractor marked "NO EXCEPTIONS TAKEN," further revision of the drawings will not be required. If one (1) print of the drawing is returned to Contractor marked "REVISE AND RESUBMIT," Contractor must revise the drawing and resubmit five (5) copies of the revised drawing to the Engineer. City reserves the right to withhold payment due Contractor to cover additional costs of the Engineer's review beyond the second submission.

(B) Fabrication of an item may not commence before the Engineer has reviewed the pertinent shop drawings and returned copies to Contractor marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED."

(C) Revisions indicated on shop drawings are deemed necessary to meet the existing requirements of the Contract Documents and may not be taken as the basis of claims for extra Work. Contractor is not entitled to claim for damages or extension of time due to any delay resulting from making the required revisions to shop drawings. The Engineer's review of the shop drawings does not relieve Contractor of responsibility for any errors or omissions contained in the shop drawings nor will such review operate to waive or modify any provision contained in the Contract Documents.

2.0 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.

3.0 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.

4.0 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.

5.0 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.

6.0 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.

7.0 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.

8.0 Use of Explosives. When the use of explosives is necessary for the prosecution of the Work, Contractor must ensure that they are used with the utmost care to avoid endangering persons or property. All explosives must be used and stored in strict accordance with all applicable federal, state, and local laws and regulations.

9.0 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 all holidays observed by the 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:7am-5pm

END OF SPECIAL CONDITIONS

TECHNICAL SPECIFICATIONS

East Main #1
Well Pump Station

CITY OF MORGAN HILL

The City of Morgan

Hill Morgan Hill,

California, June 2017

Bid Set

prepared by:

LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

500 First Street, Woodland CA, 95695
Phone: 530.661.0109, Fax: 530.661.6806

Table of Contents

Section

Division 1 – General Requirements

Summary of Work....01100
Codes and Permits....01160
Mobilization....01200
Project Records and Submittals....01330
Site Health and Safety Plan....01335
Reference Standards, Definitions and Abbreviations....01420
Temporary Barrier Fencing....01565
Delivery, Storage and Handling....01600
Operation and Maintenance Data....01730
Training Requirements....01735
Warranties and Bonds....01738
Preservation and Cleanup....01740
Project Closeout....01750

Division 2 – Site Construction

Demolition, Clearing, Grubbing and Stripping....02200
Earthwork....02300
Trench Excavation and Backfill....02320
Paving....02740
Interlocking Paving Stones....02750
Chain Link Fencing....02820

Division 3 – Concrete

Concrete....03300
Grout and Mortar....03600

Division 4 – Masonry

Concrete Masonry Units....04200

Division 5 – Metals

Structural Steel....05120

Division 6 – Wood and Plastics

Rough Carpentry....06100
Prefabricated Wood Trusses....06170

Table of Contents (Cont.)

Section

Division 7 – Thermal and Moisture Protection

Composite Shingle Roofing 07420
Joint Sealants 07900

Division 8 – (Not used)

Metal Doors and Frames 08110
Finish Hardware 08710

Division 9 – Finishes

Painting 09900

Division 10 – Specialties

Building 10050
Signs and Safety Equipment 10440

Division 11 – 12 (Not used)

Division 13 – Special Construction

Plant Control and SCADA 13450

Division 14 (Not used)

Division 15 – Mechanical

Pipe (Station, Distribution, and Drainage) 15025
Valves and Related Appurtenances 15110
Vertical Turbine Pump Components 15130
Chemical Treatment System 15140
Disinfection of Well, Pump, and Piping 15145
Fire Protection System 15300
Ventilation 15700
Performance Testing and Facility Startup 15950

Table of Contents (Cont.)

Section

Division 16 – Electrical

General Electrical 16010
Electrical Related Work 16055
Service Distribution and Grounding 16305
Motor Control Centers 16400
Transient Voltage Surge Suppression 16430
Dry Type Transformers 16460
AC Variable Frequency Drives.....16924

Landscaping

Supplemental

Appendix A Geotechnical Report

SECTION 01100 – SUMMARY OF WORK
(All work shall conform to City of Morgan Hil Standard Details)

PART 1 - GENERAL

1.01 PROJECT DESCRIPTION

A. Location

The project is located on East Main Avenue northeast of Grand Prix Way in Morgan Hill, California. The site occupies land identified as Santa Clara County Assessor's Parcel Number (APN) 726-20-053, which encompasses an area of about 3.6-acres. The pump station improvements will be on the public park portion of the parcel which runs along the entire northeast side of the parcel extending northeast for approximately 115-feet creating a rectangular shape. The site is bounded to the northwest by Calle Siena, beyond which is residential housing; to the northeast by residential housing, beyond which is Lancia Drive and more residential housing; to the southeast by East Main Avenue, beyond which is residential housing; and, to the southwest by residential housing, beyond which is Grand Prix Way and more residential housing.

B. Description of Work

The work to be completed under this contract consists of furnishing all materials, labor, equipment, fuel, and tools required to install new water pipelines and a vertical turbine well pump in existing well and related site work from the new East Main #1 Well site to the existing well pump station for the City as illustrated on the Drawings, and as detailed in these Specifications. The work required in this specification relating to the East Main #1 Well Pump Station Project includes, but is not limited to the following:

1. Clearing, grading, and compacting of the immediate site around the new well site and where the new above ground and below ground station piping, well pump pedestal, fencing, and interlocking pavestones are to be located. This work is to be accomplished prior to construction of the aboveground and underground facilities. Provide site demolition and relocation of existing park features and appurtenances as shown in the drawings.

2. Construct temporary security fence around designated work area. Note that the East Main park will remain open to the public. Contractor's site access will be limited to the existing entrance to the park. Contractor will be responsible to provide and install site gravel as needed to maintain an all-weather access to the site.

3. The trenching, installation of, backfill, and compaction all required underground piping, drains or electrical conduits.

4. Construction of one new reinforced concrete pump pedestal including all concrete, rebar,

air vent and gravel fill pipe.

5. Construction of foundations, slabs, sidewalks and structures for the pump pedestal, motor control center, electrical transformer pad, building and drainage structures and piping supports.

6. Construction of a concrete masonry unit building with a composition shingles and a removable roof section for well and pump access.

7. Installation of a 60 horsepower vertical turbine line-shaft pump, which includes the bowl assembly and suction pipe, water lubricated column assembly, discharge head, variable speed electric motor, and water level measuring equipment.

8. Install all door jambs, frames, knobs, and other related hardware to make all building entry ways complete and operable. The outside door is to be keyed to match the existing building locks and keys.

9. Installation of station piping to include valves, flanges, gages, meter and all other related appurtenances, to connect to the existing finished water pipeline.

10. Installation of sodium hypochlorite chemical feed equipment including storage tank, containment sumps, chemical feed pumps, containment shelves, scales, tubing, etc.

11. Installation of fire suppression system including piping, backflow preventer, mounting pad and enclosure cage.

12. Installation of an overflow structure and pipeline to convey waste pumpage to an existing storm water system. Work includes abandonment of existing storm drain pipeline near building.

13. Installation of chainlink security fencing and mangate surrounding the overflow structure.

14. Installation of a sanitary sewer pipeline and connection to existing sanitary sewer.

15. Installation of one 460-volt, 60-Hz, 3-phase, 4-wire electrical service including installation of the transformer pad, installation of underground primary and secondary conduits and conductors from the transformer pad to the motor control center; the motor control center; conduits for PLC/SCADA system; and, all conduits, wiring, heaters, fans, and switches.

16. Landscaping, piping and irrigation control system.

17. Placing and compacting the aggregate base, bedding sand and placement of the interlocking paving stones for the pump station driveway area including concrete curb.

18. Preparation and painting of all aboveground station piping, building, exposed well pump components and other components as specified herein.

19. Construction of three rail concrete fencing around site.

20. Restoration and clean-up of the site after project completion.

21. Performance testing of all components of the pump station.

22. Disinfection of the well, pump, and all piping and fittings.

23. Record keeping of submittals and performance testing.

24. Submission of five (5) paper copies operation and maintenance manuals for all equipment as well as one (1) electronic copy on CD-ROM.

25. Submission of two (2) 11x17 paper copies of as-built drawings for the civil, structural, mechanical, electrical, and instrumentation work at the end of construction.

1.02 QUALIFICATIONS OF THE CONTRACTOR

A. All bidders and subcontractors shall hold a valid California Contractor's License for the Work specified. Contractor shall submit as part of the bid package a list of five (5) or more prior projects, which the Contractor has installed of similar size and capacity. Projects shall have been completed within the last five (5) years. Failure to submit prior project list, shall be grounds for rejection of the bid.

1.03 CITYAND ENGINEER

A. City

City of Morgan Hill
17575 Peak Avenue
Morgan Hill, CA 95037 Telephone
Number: (650) 576-0407 Fax Number:
Contact Person: David Gittleson, P.E.

B. Engineer

Luhdorff and Scalmanini, Consulting Engineers
500 First Street
Woodland, CA 95695
Telephone number: (530) 661-0109
Fax number: (530) 661-6806
Contact person: Jason Coleman

1.04 REFERENCE STANDARDS

A. The Contract Documents also contain references to various Standard Specifications, code practices, and requirements for materials, Work quality, installation, inspections, and tests, which are published and issued by the organizations, societies, and associations. Such references are hereby made a part of the Contract Documents to the extent required. See SECTION 01420 – REFERENCE STANDARDS, DEFINITIONS AND ABBREVIATIONS.

1.05 EXAMINATION OF DOCUMENTS AND PROJECT SITE

A. Before submitting a proposal, each bidder shall carefully examine all bid documents. Bidder shall also visit the site and fully inform himself as to all existing conditions and limitations applying to the Work. If, after such examination and study, it appears that any change from the Drawings and Specifications should be allowed, the bidder shall so state in writing seven (7) days prior to submission of bids.

B. By the act of submitting a proposal, each bidder shall be deemed to have made such examinations of the Drawings, Specifications and premises, and it will be assumed that the bidder is therefore familiar with the entire scope of the project and has based the proposal upon the Work described in the Drawings and Specifications and upon all existing conditions and limitations applying to the bidder's Work. The bidding Contractor shall not withhold information related to conflicts of the Contract Documents and should seek interpretation during the bidding.

1.06 PRE-CONSTRUCTION CONFERENCE

A. A pre-construction conference shall be held prior to the commencement of Work in the field, for the purpose of discussing with the Contractor the scope of Work, Drawings, and Specifications, and the Contractor's schedule. Unless otherwise approved by the Engineer, the Contractor's proposed superintendent shall be present and one representative from each listed subcontractor. The Engineer will schedule the time and date for said conference. The Contractor shall document the existing condition of the site by taking digital pre-construction photographs of the site directly after the pre-construction meeting. An electronic copy of the photos shall be submitted to the Engineer prior to the start of Construction.

1.07 BEGINNING OF WORK, TIME OF COMPLETION, LIQUIDATED DAMAGES

A. Contractor shall conform to CALTRANS Standard Specification provisions contained in Section 8-1.04, "Start of Job Site Activities", Section 8-1.05, "Time" and Section 8-1.10, "Liquidated Damages," and these special provisions.

1. **Beginning of Work**
   The Contractor shall begin Work within ten (10) calendar days from the Notice to Proceed and shall diligently prosecute the same to completion. Contractor may begin

work immediately after receiving Notice to Proceed.

2. **Time of Completion**
   The Contractor shall complete the Work in 180 Calendar Days after the date of receipt of the Notice to Proceed.

3. **Liquidated Damages**
   The Contractor shall pay to City the sum of $1,000 per day, for each and every calendar day delay in finishing the Work in excess of the number of working days prescribed above.

1.08 MATERIALS FURNISHED BY CONTRACTOR

A. All materials furnished by the Contractor shall be new, in first-class condition and subject to the approval of the Engineer.

1.09 CONTRACTOR'S TEMPORARY FACILITIES

A. Electricity

The Contractor shall provide, at its own cost, all electric power required for construction, general and security lighting, and all other purposes as deemed necessary. The Contractor shall make any necessary arrangements with the local electric utility company for temporary electric service and shall pay all expenses in connection therewith.

B. Water

The City will provide water for disinfecting and testing of the facilities. The Contractor shall supply all associated backflow prevention devices and piping for the connection to the City's system throughout construction. The Contractor shall provide and maintain protective barricades around the service area during construction.

C. Heating, Cooling and Ventilation

Provide temporary heating, cooling and ventilation as required to maintain adequate environmental conditions to facilitate progress of the Work, to meet specified minimum conditions for the installation of materials and to protect materials and finishes from damage due to temperature or humidity.

Provide adequate forced ventilation of enclosed areas for curing of installed materials, to disperse humidity and to prevent hazardous accumulations of dust, fumes, vapors or gases.

Portable heaters shall be standard approved units complete with controls.

D. Sanitary Facilities

The Contractor shall make arrangements for providing sanitary facilities in compliance with laws and regulations for their personnel. Locations of sanitary facilities, storage areas, parking and other Contractor installations shall be subject to the prior approval of the

Engineer. Service, clean and maintain facilities and enclosures.

E. Air and Steam

Provide all air and steam, including temporary piping and appurtenances required for cleaning and testing pipelines and equipment necessary for Contractor's and subcontractor's work. Remove temporary piping and appurtenances upon approval of equipment being tested.

1.10 WORK HOURS

A. Work may be performed between the hours of 7:00 a.m. and 6:00 p.m. Monday through Friday. If work is planned to performed outside of these hours the Contractor shall obtain permission from the City or Engineer prior.

B. The Contractor shall not Work on the City's Holidays unless prior approval is obtained from the Engineer and arrangements for inspection services are made. The City's Holidays are as follows:

1. New Year's Day
2. Martin Luther King Jr.'s Birthday
3. Presidents Day
4. Memorial Day
5. Independence Day
6. Labor Day
7. Columbus Day
8. Veterans Day
9. Thanksgiving Day
10. Day after Thanksgiving
11. Christmas Eve
12. Christmas Day
13. New Year's Eve

1.11 SAFETY AND PRECAUTIONS

A. General

The Contractor shall conduct operations in accordance with the rules and regulations of the Local Government, California Division of Industrial Safety, and the current requirements of the Occupational Safety and Health Administration (Cal. OSHA). Contractor is responsible for site conditions, including public safety, dust control, and sediment control, continually and not limited to normal working hours. Contractor shall provide contact information for representatives available during working hours and during after-hours, weekends, and holidays.

B. Noise Control

It shall be the Contractor's responsibility to keep noise due to construction activities as low

as possible. Contractor shall take measures to minimize noise of construction and shall be responsible for compliance with City noise ordinances. All measures to mitigate noise shall be included in the prices stated on the Bid Form with no additional or separate payment by the City.

In the event that these minimum requirements do not achieve acceptable noise mitigation, Contractor shall employ additional measures at no additional cost to the City. In no case shall noise levels produced by the Contractor exceed any of the following maximums:

1. No individual piece of equipment shall produce a noise level exceeding 86 dBA at a distance of 25 feet.

2. The noise level at any point outside of the property line or temporary construction area shall not exceed 86 dBA during standard work hours or 60 dBA during standard nonworking hours. Noise level from approved 24 hour/day work occurring outside standard working hours shall not exceed 60 dBA. No equipment violating these standards will be allowed to operate.

3. Any other local jurisdiction requirements.

C. Dust Prevention

Contractor shall use water to prevent abnormal dust conditions due to construction operations, as deemed necessary by Engineer. Contractor will be allowed to draw water from the City only after obtaining a hydrant meter from the City and an inspection of a proper backflow device or "air-gap" filling pipe. Contractor shall keep down dust from construction activity to the maximum extent possible. Contractor shall clean all existing streets, curbs, gutters, and sidewalks affected by the project at the end of each working day.

D. Traffic Control

It may or may not be necessary to close one (1) lane of traffic. It is the Contractor's responsibility to meet all City and County requirements and obtain all necessary permits to close down a traffic lane.

Contractor shall submit and implement a traffic control plan in accordance with City standards. Contractor shall submit a traffic control plan for approval to the Public Works Department a minimum of 5 days prior to any work within an existing public street. A licensed Traffic Engineer shall sign the plan when it involves an arterial street. Contractor shall provide all necessary traffic control in accordance with the latest edition of CALTRANS "Manual of Warning Signs, Lights, and Devices for Use in Performance of Work Upon Highways", while working within the public right-of-way. Two traffic lanes (10' min.) shall be open to vehicular traffic during all hours, weekends, and holidays. One lane one way traffic, may be permitted under the control of not less than 2 (two) competent flagmen during construction operations. Street closures and detours shall only take place upon City Engineer approval and Police Department coordination. (Refer to City of Morgan Hill Standards, specifically General Notes on Drawing No. G-II).

E. Sidewalks and Curbs

The Contractor shall take the appropriate measures to protect City property from becoming damaged, including sidewalks and curbs. During the course of the project, if the Contractor damages any public or private property, the Contractor shall repair or replace it at the Contractor's expense.

F. Fencing and Pedestrian Traffic

The site shall be completely enclosed with orange mesh barrier fencing and signs shall be posted to direct pedestrian traffic around the Work area in accordance with City and County ordinances.

G. Well Security

The Contractor shall provide at all times during well construction suitable means of protecting the well bore and casing assemblies, when installed, from the entrance of foreign objects.

H. Tree Protection

Tress located within the designated Contractor's work area shall be enclosed/protected with orange mesh barrier fencing.

1.12 PERMIT REQUIREMENTS

A. The Contractor shall comply with the terms and conditions of all appropriate licenses or permits as outlined in SECTION 01160 – CODES AND PERMITS.

1.13 PRESERVATION, RESTORATION, AND CLEANUP

A. Preservation and Cleanup

At all times during the Work, keep the premises clean and orderly, and upon completion of the Work, repair all damage caused by equipment and leave the project free of rubbish or excess materials of any kind. Refer to SECTION 01740 – PRESERVATION AND CLEANUP for project preservation and cleanup requirements.

B. Erosion and Sediment Control

The Contractor shall exercise care and diligence to limit damage caused by erosion and sediment loosened by the Contractor's operation and shall take all precautions necessary to sustain adjacent properties. Refer to SECTION 02300 – EARTHWORK for erosion control requirements.

The Contractor shall exercise care and diligence to limit damage caused by erosion and sediment loosened by the Contractors operation and shall take all precautions necessary to sustain adjacent properties.

If excavation activity is initiated during the rainy season (November 15 through March 15),

the Contractor shall install wire-backed, silt fencing and straw bale barriers as directed by the Engineer. The Contractor shall maintain and repair the silt fences and straw bales including cleanup and disposal of sediments, when directed by the Engineer. Repairs as required and sediment cleanup and disposal will be at no additional cost to the City. The silt fences and straw bales shall be removed and properly disposed of by the Contractor upon completion of construction.

All existing drainage ditches and culverts shall be reopened and graded and natural drainage restored. Restore culverts broken or damaged to their original condition and location.

C. Existing Landscaping to be Replanted

The existing landscaping surrounding the well site, if damaged, shall be replanted or otherwise replaced in kind, at the completion of construction.

D. Discharge of Water

Discharge of any water, shall be at a location delineated by the City. Water discharged at pump startup shall be monitored in accordance with SECTION 15950 – PERFORMANCE TESTING AND FACILITY STARTUP. All chlorinated water shall be completely dechlorinated prior to disposal.

1.14 INSPECTION AND TESTING

A. The Contractor shall not cover, or allow to be covered, any of the Work installed under this Contract before it has been inspected and approved by the Engineer. Should any of the Work be covered prior to such approval, the Engineer shall have the authority to require the Work to be uncovered for inspection and approval, recovered, and all resultant damage repaired, at the Contractor's expense.

1. The City will employ, and pay for services of an independent material testing laboratory.

2. The laboratory will perform inspections, tests, and other services specified in individual Specification sections and as required by the Engineer.

3. Reports will be submitted by the laboratory to the Engineer, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

4. The Contractor shall cooperate with the laboratory; furnish samples of materials, design mix, equipment, tools, storage and assistance as requested.

    a. The Contractor shall notify Engineer and the laboratory 48-hours prior to requiring services.

    b. The Contractor shall make arrangements with the laboratory and pay for any additional samples and tests required for Contractor's use.

5. Re-testing or re-inspection required because of non-conformance to specified requirements shall be performed by the same laboratory on instructions by the Engineer. Payment for re-testing or re-inspection will be the responsibility of the Contractor.

PART 2 – MATERIALS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – MEASUREMENT AND PAYMENT

No separate payment will be made for Summary of Work. Payment for work in this section shall be included as part of the applicable Lump Sum or Unit Prices stated in other sections.

-END OF SECTION-

SECTION 01160 - CODES AND PERMITS

PART 1 - GENERAL

1.01 SCOPE

A. This Section describes: (1) the applicable codes and standards by which all Work is governed except where more stringent and/or expensive requirements are specified or shown in the Contract Documents; (2) the permits relating to this project for which the City either has obtained or will obtain and pay the associated fees; and (3) the permits which the Contractor shall obtain and for which the City shall pay the associated fees directly to the permitting agency. All other permits and fees are the responsibility of the Contractor, some of which are listed in this Section.

B. Specific reference in the Specifications to codes and regulations or requirements of regulatory agencies shall mean the latest printed edition of each adopted by the regulatory agency in effect at the time of the opening or submittal of bids, except as may be otherwise specifically stated in the Contract Documents.

C. Should any conditions develop not covered by the Contract Documents wherein the finished Work will not comply with current codes, a change order detailing and specifying the required Work shall be submitted to and approved by City before proceeding with the Work.

D. Where no requirements are identified on Drawings or in Specifications, comply with all requirements of applicable codes, ordinances and standards of governing authorities having jurisdiction.

E. If any of these laws and standards should conflict with any of the Specifications contained herein, the Contractor shall notify the Engineer in writing and the Engineer shall resolve the conflict.

1.02 RELATED WORK

A. SECTION 01100 – SUMMARY OF WORK

B. SECTION 01420 – REFERENCE STANDARDS, DEFINITIONS, AND ABBREVIATIONS

1.03 APPLICABLE LAWS, CODES, ORDINANCES, AND REGULATIONS

A. During prosecution of Work to be done under the Contract Documents, Contractor shall comply with the applicable laws, ordinances, rules, and regulations, including, but not limited to, the following:

1. Federal

a. 29 CFR, Section 1910.1001, Asbestos
b. 40 CFR, Subpart M, National Emission Standards for Asbestos
c. Clean Water Act
d. Federal Endangered Species Act

2. State of California

a. California Department of Public Health, CDPH
b. California Department of Transportation, CALTRANS
c. California Endangered Species Act
d. California Environmental Quality Act
e. Office of the State Fire Marshall
f. Department of Fish and Game
g. Office of Statewide Health Planning and Development
h. State and Consumer Services Agency
i. Cal/OSHA
j. California Building Code
k. California Fire Code
l. California Electrical Code
m. California Mechanical Code
n. California Plumbing Code
o. California Labor Code
p. California Civic Code
q. California Government Code
r. California Code of Civil Procedure
s. California Public Resources Code
t. California Water Code
u. California Health and Safety Code
v. California Public Contract Code
w. California Code of Regulations, Titles 5, 8, 19, 21, 22, 24, and 25

3. Local Agencies

a. City of Morgan Hill Municipal Code
b. Santa Clara County Standard Engineering Specifications
c. Santa Clara County Fire Department
d. Santa Clara County of Environmental Health
e. City of Morgan Hill Department of Public Works

B. References on Drawings or in Specifications to “code” or “building code” not otherwise identified shall mean the codes specified in this Section, together with all additions, amendments, changes, and interpretations adopted by code authorities of the jurisdiction.

1.04 OUTLINE AND PURCHASE OF APPLICABLE PERMITS

A. Codes, laws, ordinances, rules and regulations referred to shall have full force and effect as though printed in full in these Specifications. Codes, laws, ordinances, rules and regulations are not furnished to Contractor, because Contractor is assumed to be familiar with these requirements. The Contractor shall comply with the terms and conditions of all appropriate licenses or permits.

B. The Contractor shall supply the Engineer with a list of all permits and licenses that the Contractor is required to obtain and the expected date of receipt of the permit from the authorizing agency. Permits and licenses to be obtained by the Contractor shall include but are not limited to the following:

1. **Stormwater Discharge (NPDES) Permit**
   The Contractor shall secure the National Pollution Discharge Elimination System (NPDES) General Permit for Stormwater Discharges Associated with Construction Activity, including the required Notice of Intent (NOI) and Storm Water Pollution Prevention Plan (SWPPP) and Best Management Practices.

2. **Building Permit Application**
   The Contractor shall complete and submit all necessary applications for electrical & plumbing service at the site. The City shall be responsible for all fees for electrical service.

3. **Encroachment Permit**
   The Contractor shall secure City of Morgan Hill encroachment permit(s) for the connection to existing storm, sewer and water supply facilities and contract work construction in the public right-of-way. The encroachment permit fee will be waived by the City of Morgan Hill. The Contractor shall obtain and pay for all other permits associated with the Work.

4. **Backflow Permits**
   The Contractor shall be responsible for obtaining backflow preventors and permits from City of Morgan Hill for installation of backflow preventors.

PART 2 – MATERIALS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – MEASUREMENT AND PAYMENT

No separate payment will be made for Codes and Permits. Payment for work in this section shall be included as part of the applicable Lump Sum or Unit Prices stated in other sections.

-END OF SECTION-

SECTION 01200 – MOBILIZATION

Bid Item No. 1

PART 1 – GENERAL

1.01 SCOPE

A. This section covers mobilization which shall consist of preparatory work and operations, including, but not limited to, those necessary for the movement of personnel, equipment, supplies and incidentals to the project site; for the establishment of all offices, buildings, sanitation and other facilities necessary for work on the project; and for all other work and operations which must be performed or costs incurred prior to beginning work on the various contract items at the project site, complete.

PART 2 – MATERIALS (Not used)

PART 3 – EXECUTION (Not used)

3.01 MOBILIZATION

A. Location of sanitary facilities, storage areas, parking areas and other Contractor installations shall be subject to the prior approval of the Engineer. The following principle items shall be included in the Contractor's mobilization.

1. The Contractor shall move all of the necessary plant and equipment that will be required for the first month of operation onto the job site.

2. The Contractor shall provide any needed temporary construction power and lighting facilities.

3. The Contractor shall comply with all fire protection requirements.

4. The Contractor shall provide on-site sanitary facilities.

5. The Contractor shall obtain all necessary permits. See SECTION 01330 – PROJECT RECORDS AND SUBMITTALS for additional requirements.

6. The Contractor shall comply with all OSHA required notices and establish safety programs.

7. The Contractor shall comply with all required CEQA mitigation measures. The Contractor shall note that the noise mitigation requirements must be in-place prior to any other work taking place on-site.

8. The Contractor shall have the construction superintendent on the job site full time.

9. The Contractor shall submit a Storm Water Pollution Prevention Plan and Best Management Practices to the State Regional Water Quality Control Board. A copy of both documents shall be on-site at all times.

PART 4 – MEASUREMENT AND PAYMENT

A. When the monthly progress payment estimates of the amount earned, not including the amount earned for mobilization, is five (5) percent or more of the original contract amount, fifty (50) percent of the contract item price for mobilization shall be included in said estimate for payment.

B. When the monthly progress payment estimates of the amount earned, not including the amount earned for mobilization is fifty (50) percent or more of the original contract amount, the total amount earned for mobilization shall be one hundred (100) percent of the contract item price for mobilization and said amount shall be included in said estimate for payment.

C. The contract lump sum price paid for mobilization shall include full compensation for furnishing all labor, material, tools, equipment, and incidentals for doing all the work involved in mobilization as specified herein.

D. No adjustment shall be made what-so-ever to the original lump sum item price of mobilization. If other contract items are adjusted, and if the costs applicable to such item work include mobilization cost, such mobilization will be deemed to have been recovered by the payments made for mobilization, and will be excluded from consideration in determining compensation.

E. The retention provisions contained in this contract shall apply to the lump sum item price of mobilization.

F. All work as specified herein, satisfactorily completed, shall be paid for on a Lump Sum basis as stated in **Bid Item Schedule** for the item listed below and shall be no more than five percent (5%) of the Bid Total:

Bid Item No. 1 – MOBILIZATION

-END OF SECTION-

SECTION 01330 - PROJECT RECORDS AND SUBMITTALS

Bid Item No. 2

PART 1 - GENERAL

1.01 SCOPE

A. This Section specifies the general methods, requirements and procedures of Contractor submissions applicable to Shop Drawings, Product Data, Samples, Calculations, Mock Ups, Construction Photographs, Construction or Submittal Schedules, Schedule of Values, and other documentation required for material approval to be submitted by the Contractor during the project and following completion of the work. Detailed submittal requirements are specified in the technical provisions in this section.

PART 2 - MATERIALS (Not Used)

PART 3 - EXECUTION

3.01 CONTRACTOR'S RESPONSIBILITIES

A. Submittal Review

Review Shop Drawings, product data and samples, including those by Subcontractors, prior to submission to determine and verify the following:

1. Field measurements
2. Field construction criteria
3. Catalog numbers and similar data
4. Conformance with related Sections

B. Certification Statement

Each shop drawing, sample and product data submitted by the Contractor shall have affixed to it the following Certification Statement including the Contractor's Company name and signed by the Contractor:

"Certification Statement: by this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved Shop Drawings and all Contract requirements."

Shop Drawings and product data sheets 11-inch x 17-inch and smaller shall be bound together in an orderly fashion and bear the above Certification Statement on the cover sheet. The cover sheet shall fully describe the packaged data and include a listing of all items within the package. Provide to the Resident Project representative a copy of each transmittal sheet for Shop Drawings, product data and samples at the time of submittal to the Engineer.

C. Numbering System

The Contractor shall utilize an 8-character submittal identification numbering system in the following manner:

1. The first five digits shall be the applicable specification section number.

2. The next two digits shall be the numbers 01 to 99 to sequentially number each initial separate item or drawing submitted under each specific Section Number.

3. The last character shall be a letter, A to Z, indicating the submission, or resubmission of the same Drawing, i.e., "A=1st submission, B=2nd submission, C=3rd submission, etc. A typical submittal number would be as follows:

   03300-08-B

   03300 = Section for Concrete
   08 = The eighth initial submittal under this section
   B = The second submission (first resubmission) of that particular shop drawing

D. Notify the Engineer in writing, at the time of submittal, of any deviations in the submittals from the requirements of the Contract Documents.

E. The review and approval of Shop Drawings, samples or product data by the Engineer shall not relieve the Contractor from the responsibility for the fulfillment of the terms of the Contract. The Contractor assumes all risks of error and omission in submittals - the Engineer will have no responsibility for Contractor mistakes.

F. No portion of the work requiring a shop drawing, sample, or product data shall be started nor shall any materials be fabricated or installed prior to the approval or qualified approval of such item. Fabrication performed, materials purchased or onsite construction accomplished which does not conform to approved Shop Drawings and data shall be at the Contractor's risk. The City will not be liable for any expense or delay due to corrections or remedies required to accomplish conformity.

3.02 SUBMITTAL REQUIREMENTS

A. Submittals shall be delivered promptly in accordance with approved schedule and in such sequence, as to cause no delay in the work or in the work of any other Contractor. Contractor shall submit all submittals to Engineer. Submittals shall include:

1. The date of submission and the dates of any previous submissions.

2. The Project title and number.

3. Contractor identification.

4. The names of:

   a. Contractor
   b. Sub-Contractor
   c. Supplier
   d. Manufacturer

5. Identification of the product, with the section number, page and paragraph(s). Where catalog or cut sheets contain more than one model or option(s) for the product, the specific model or option(s) proposed shall be highlighted, circled, or otherwise clearly indicated within the submittal.

6. Field dimensions, clearly identified as such.

7. Relation to adjacent or critical features of the Work or materials.

8. Applicable standards, such as ASTM, AWWA or Federal Standards numbers.

9. Identification by colored highlighting of deviations from Contract Documents.

10. Identification by colored highlighting of revisions on resubmittals.

11. A 5-inch x 3-inch blank space for Engineer review stamp.

12. Where calculations are required to be submitted by the Contractor, the calculations shall have been checked by a qualified individual other than the preparer. The submitted calculations shall clearly show the names of the preparer and of the checker.

B. At least ten (10) working days prior to the need for approval, the Contractor shall forward to the Engineer, for approval, all submittals required by the individual sections of the specifications. No extension of time will be authorized because of the Contractor's failure to transmit submittals sufficiently in advance of the work. Unless a different number is called for by an individual section, six (6) copies of each shop drawing, material description, and specification literature and three (3) specimens of each sample are required, all of which will be retained or distributed by the Engineer. If the Contractor requires more than two copies returned, the Contractor shall submit any additional number of shop drawings and literature, in addition to the above requirements. Contractor shall number each type of material separately and identify the use of each material. All submittals shall be clearly identified by reference to Section Number, Paragraph, Drawing Number or Detail as applicable. Submittals shall be clear and legible and of sufficient size for presentation of data.

C. All submittals shall be transmitted to the Engineer by mail or in person with the letter of transmittal included in these documents. The Engineer will return all reviewed submittals to

the Contractor within ten (10) working days.

D. Contractor shall coordinate all such drawings, and review them for legibility, accuracy, completeness, and compliance with contract requirements, and shall indicate approval thereon as evidence of such coordination and review.

E. Submittals shall be delivered promptly in accordance with approved schedule and in such sequence, as to cause no delay in the Work or in the Work of any other Contractor. Contractor shall submit all submittals to Engineer. Submittals shall include:

F. Supervisory Personnel

Within seven (7) calendar days after receiving the Notice to Proceed and before any work has begun, the Contractor shall submit four (4) copies of a list of supervisory personnel who will be responsible for the performance of the Contract. The Contractor shall designate one (1) person who will have full decision-making authority to represent the Contractor on a daily basis at the project site. The list shall include phone numbers where the Engineer may reach the Contractor's personnel.

G. Shop Drawings

The term "shop drawings" includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials furnished by the Contractor to explain in detail specific portions of the work required by the Contract.

1. Shop drawings as specified in individual Sections include, custom-prepared data such as fabrication and erection/installation (working) drawings, scheduled information, setting diagrams, actual shop work manufacturing instructions, custom templates, special wiring diagrams, coordination drawings, individual system or equipment inspection and test reports including performance curves and certifications, as applicable to the work.

2. All shop drawings submitted by subcontractors and vendors for approval shall be sent directly to the Contractor for checking. The Contractor shall be responsible for their submission at the proper time so as to prevent delays in delivery of materials.

3. The Contractor shall check all subcontractors' and vendors' shop drawings regarding measurements, size of members, materials and details to make sure that they conform to the intent of the Drawings and related Sections. Return shop drawings found to be inaccurate or otherwise in error to the subcontractors for correction before submission thereof.

4. All details on shop drawings shall show clearly the relation of the various parts to the main members and lines of the structure and where correct fabrication of the work depends upon field measurements, such measurements shall be made and noted on the drawings before being submitted.

H. Product Data

Product data as specified in individual Sections include, standard prepared data for manufactured products (sometimes referred to as catalog data), such as the manufacturer's product specification and installation instructions, availability of colors and patterns, manufacturer's printed statements of compliances and applicability, roughing-in diagrams and templates, catalog cuts, product photographs, standard wiring diagrams, printed performance curves and operational-range diagrams, production or quality control inspection and test reports and certifications, mill reports, product operating and maintenance instructions and recommended spare-parts listing and printed product warranties, as applicable to the work.

I. Certificates

When called for in individual sections, the Contractor must furnish certificates from manufacturers, suppliers, or others certifying that materials or equipment being furnished under the Contract comply with the requirements of these specifications. Certificates of compliance shall conform to the provisions in Section 6-2.03C "Certificates of Compliance" of the CALTRANS Standard Specifications and these special provisions. Certificates of compliance from the Contractor, suppliers, and/or manufacturers, shall clearly indicate that the material to be delivered to the jobsite will meet all requirements of the specifications. A certificate of compliance shall include, but not be limited to the project title, delivery location, date (or approximate date) of delivery, name of the material with appropriate classification or model numbers, quantity, name of the manufacturer, statement of compliance with all requirements of the specifications, and certifier's name, title and signature. In addition, a factory or mill certification (laboratory test report), if required by the specifications, shall be submitted with certificate of compliance. The factory or mill shall not substitute the certificate of compliance, unless it contains all information required for a certificate of compliance as described above. Insufficient, incomplete, or unclear certificates shall be rejected and shall be resubmitted. The Contractor shall be responsible for all delays caused by the re-submittals.

J. Samples

Samples specified in individual Sections include, physical examples of the work such as sections of manufactured or fabricated work, small cuts or containers of materials, complete units of repetitively-used products, color/texture/pattern swatches and range sets, specimens for coordination of visual effect, graphic symbols and units of work to be used by the Engineer or City for independent inspection and testing, as applicable to the work.

3.03 ENGINEER'S APPROVAL

A. The Engineer will indicate approval or disapproval of each submittal, and the reasons for disapproval.

1. If no corrections are required, the copies will be returned marked "NO EXCEPTIONS TAKEN" and work may begin immediately on incorporating the material and equipment covered by the submittal into the project.

2. If limited corrections are required, the copies will be returned marked "MAKE CORRECTIONS NOTED." Work may begin immediately on incorporating the material

and equipment covered by the corrected submittal into the project.

3. If insufficient or incorrect data has been submitted, the copies will be returned marked “AMEND & RESUBMIT.” No work incorporating the material and equipment covered by this submittal into the project may begin until the submittal has been revised, resubmitted, and returned marked either “NO EXCEPTIONS TAKEN” or “MAKE CORRECTIONS NOTED.”

4. If the submittal is unacceptable, the copies will be returned marked “REJECTED” No work incorporating the material and equipment covered by this submittal into the project may begin until a new submittal has been made and returned marked either “NO EXCEPTIONS TAKEN” or “MAKE CORRECTIONS NOTED.”

5. The Contractor shall not change any drawing after it has been marked “NO EXCEPTIONS TAKEN” or “MAKE CORRECTIONS NOTED”, or change any approved equipment or material without written permission of the Engineer.

6. Resubmittals will be handled in the same manner as first submittals. The Contractor shall identify all revisions made to the original submittals in the resubmittal, either in writing on the letter of transmittal or on the shop drawings by the use of color highlighting, and by use of revision triangles or other similar methods. The resubmittal shall clearly respond to each comment made by the Engineer on the previous submission. Additionally, the Contractor shall direct specific attention to any revisions made other than the corrections requested by the Engineer on previous submissions.

7. If more than two (2) submittals for a single item are required because of incorrect or insufficient data, or the submittal is unacceptable, or because the Contractor wishes to change previously approved material, then all costs incurred by the Engineer for the additional review shall be deducted from monies due the Contractor.

8. Partial submittals may not be reviewed. The Engineer will be the only judge as to the completeness of a submittal. Submittals not complete will be returned to the Contractor and will be considered "Not Approved" until resubmitted. The Engineer may at his option provide a list or mark the submittal directing the Contractor to the areas that are incomplete.

9. Approval by the Engineer shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with requirements of this Contract. At the time of submission, the Contractor shall provide on the submittal coversheet specific written notice of all variations, if any, that the submittal may have from the Contract Documents and the reasons therefore. In addition, the Contractor shall provide a specific notation on each item submitted for the Engineer’s review and approval of each variation. All such variations must be approved by the Engineer.

3.04 NOTIFICATIONS

A. The Contractor shall notify the Engineer at least two (2) working days prior to commencement of the construction in writing and shall give the Engineer at least one (1) working day notice when inspections are required.

B. If the Contractor considers any correction indicated on the shop drawings to constitute a change to the Contract Documents, the Contractor shall give written notice thereof to the Engineer at least seven (7) working days prior to release for manufacture.

3.05 AS-BUILT DRAWINGS

A. The Contractor shall maintain a separate, neat, and legible set of construction drawings showing as-built conditions of all constructed facilities as specified herein and in SECTION 01750 – PROJECT CLOSEOUT. Changes shall be shown to scale in red on the appropriate Drawings. The locations of installed underground and hidden utilities will be shown and dimensioned to appropriate reference points. No work shall be permanently concealed until the required information has been recorded. Relevant change orders shall be noted on the Drawings by number and date.

B. Where the Drawings are not of sufficient size, scale, or detail, the Contractor's own drawings shall be submitted for incorporation of details and dimension. In such cases, the Contractor shall provide a reproducible set of drawings, suitability cross referenced to the Contract Drawings.

C. The As-Built drawings shall be maintained at least weekly. Prior to any progress payments, the Engineer shall review the status of the as-built construction drawings. The Engineer shall withhold approval of progress payments until the as-built drawings are up to date.

D. Upon completion of the Contract, the Contractor shall furnish two (2) satisfactory sets of As-Built construction drawings prior to or simultaneously with the Contractor's request for final payment. The Contractor shall certify that the As-Built drawings show the existing conditions correctly. Final payment shall be withheld until the As-Built construction drawings are received and approved by the Engineer.

PART 4 - MEASUREMENT AND PAYMENT

All work as specified herein, satisfactorily completed, shall be paid for on a Lump Sum basis as stated in **Bid Item Schedule** for the item listed below and shall be no more than one percent (1%) of the Bid Total:

Bid Item No. 2 – PROJECT RECORDS AND SUBMITTALS

-END OF SECTION-

SECTION 01335 – SITE HEALTH AND SAFETY PLAN

PART 1 – GENERAL

1.01 SCOPE

A. This section covers the work necessary to furnish and maintain a specific Site Health and Safety Plan. A site specific Health and Safety Plan shall be prepared by the Contractor for the purpose of assigning safety responsibilities, establishing personnel protection standards, outlining mandatory safety procedures, and providing for contingencies that may arise during field operations. All onsite employees of the Contractor involved in the field-work shall be required to follow the provisions of the Health and Safety Plan.

PART 2 – MATERIALS (Not used)

PART 3 – EXECUTION

3.01 HEALTH AND SAFETY PLAN

A. The Contractor shall prepare a site Health and Safety Plan which includes, at a minimum, the following:

1. **Provide an On-Site Safety Officer**
   The On-Site Safety Officer, who may also be a working member of the construction crew, will be responsible for:

   a. Implementing the Health and Safety Plan and reporting any deviations from the anticipated conditions described in the Plan to the Office Safety Coordinator for action.

   b. Ensuring that all equipment is operating properly and provide for maintenance if it is not.

   c. Ensuring that sufficient properly fitted personnel protective equipment is available for use as necessary or required.

2. **Train/Brief All Contractor Personnel Involved in On-Site Construction Activities**
   The Contractor shall insure that all construction personnel have reviewed and understand the Site Health and Safety Plan. Specifically, Contractor personnel shall:

   a. Take all reasonable precautions to prevent injury to themselves and to other personnel.

   b. Implement the procedures set forth in the Health and Safety Plan, and report any deviations from the procedures described in the Plan to the on-site Safety Officer or Office Safety Coordinator for action.

c. Immediately report any accidents or unsafe conditions to the on-site Safety Officer or the Office Safety Coordinator.

3. Evaluate the Need for Personnel Protective Equipment

The Contractor shall provide a list of protective equipment which will be required for construction activities at the well site. Prior investigation at the site indicates that modified level D protection is adequate protection against organic chemical exposure. General construction operations will not require respiratory protection.

4. Familiarize Personnel with Safe Work Practices

Eating, drinking, and smoking shall be prohibited in areas determined to be potentially contaminated.

All field personnel should utilize all their senses to alert them to potentially harmful situations.

Field personnel shall become familiar with the physical characteristics of the area in which they are working, including wind direction, accessibility to other personnel, equipment and vehicles, communication, areas of known or potential contamination, site access, and the nearest water source.

5. Emergency Response

The Contractor shall prepare an emergency response plan prior to commencement of any on-site work, which includes, at a minimum, a list of emergency contacts, the locations of the nearest telephones (vehicle or other), emergency procedures, and directions to the nearest hospital.

PART 4 – MEASUREMENT AND PAYMENT

No separate payment will be made for Site Health and Safety Plan. Payment for work in this section shall be included as part of the applicable Lump Sum or Unit Prices stated in other sections.

-END OF SECTION-

SECTION 01420 – REFERENCE STANDARDS, DEFINITIONS AND ABBREVIATIONS

PART 1 – GENERAL

1.01 REFERENCE STANDARDS

A. The Contract Documents contain references to various standard specifications, code practices, and requirements for materials, work quality, installation, inspections, and tests, which are published and issued by various organizations, societies, and associations. Such references are hereby made a part of the Contract Documents to the extent required.

B. When such references are specified, and the effective dates are not given, it shall be understood that the current edition or latest revision thereof and any amendments or supplements in effect on the date that the work is advertised for Bids shall govern the work.

C. Reference standards are not furnished with the Contract Documents since the Contractor, subcontractors, manufacturers, and the trades involved are assumed to be familiar with their requirements. The Engineer will furnish, upon request, information as to how copies of specified standards may be obtained.

1.02 INTERPRETATION OF SPECIFICATIONS AND DRAWINGS

A. The Special Provisions, Description of Work, Construction Details, Drawings, Shop Drawings, Contract Change Orders, and all other supplementary documents are essential parts of the Contract Documents, and a requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for complete work. In resolving conflicts resulting from errors or discrepancies in any of the Contract Documents, the order of precedence shall be as follows:

1. Environmental Permits (CEQA, EIR, etc.) or permits from other agencies as may be required by law.

2. Addenda, Supplemental Agreements and Change Orders (with those of later date having preference over those of earlier date.

3. The Contract Agreement

4. Contractor’s Bid (Bid Form)

5. Special Provisions

6. General Requirements

7. Supplementary General Conditions

8. Invitation to Bid

9. Instructions to Bidders

10. Technical Specifications (All Divisions)

11. Shop Drawings

12. Drawings

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

1. Figures govern over scaled dimensions

2. Detail or Shop Drawings govern over General Drawings.

3. General Drawings govern over standard drawings.

4. Addenda/Change Order Drawings govern over any other Drawings

5. Specifications shall govern over Drawings, except where items are shown on the Drawings and are not specifically included in the Specifications, then the Drawings shall govern.

C. The provisions or the Contract Documents shall take precedence over any Laws or Regulations applicable to the performance of the work unless such an interpretation of the provisions of the Contract Documents would result in a violation of such Law or Regulation.

D. Where specified requirements differ from the requirements of applicable codes, ordinances and standards, the more stringent requirements shall take precedence. Where Drawings or Specifications require or describe products or execution of better quality, higher standard or greater size than required by applicable codes, ordinances and standards, Drawings and Specifications shall take precedence so long as such increase is legal.

E. Should it appear that the work to be done or any of the matters relative to the project are not sufficiently detailed or explained in the Contract Documents, the Bidder or Contractor shall apply in writing to the Engineer for further explanations as may be necessary.

1.03 LAWS, CODES AND REGULATIONS

A. All materials, installation, and construction shall comply with the applicable provisions of current laws, safety rules and regulations of the City of Morgan Hill, County of Santa Clara County, the State of California, the Federal Government, and any other applicable authority. In this connection, the Contractor's special attention is directed to the following:

ACI	-	American Concrete Institute
AISC	-	American Institute of Steel Construction
ASTM	-	American Society for Testing and Materials
AWWA	-	American Water Works Association
CEQA	-	California Environmental Quality Act
EPA	-	Environmental Protection Agency
NFPA	-	National Fire Protection Association
NEC	-	National Electric Code
OSHA	-	Occupational Safety and Health Administration
RCRA	-	Resource Conservation and Recovery Act
UBC	-	Uniform Building Code
UFC	-	Uniform Fire Code
UMC	-	Uniform Mechanical Code
UPC	-	Uniform Plumbing Code

B. Whenever reference is made to "CALTRANS Standard Specifications" it shall be understood to be the most recent addition of the State of California, Department of Transportation, Standard Specifications.

C. If any of these laws and standards should conflict with any of the Specifications contained herein, the Contractor shall notify the Engineer in writing and the Engineer shall resolve the conflict.

1.04 REGULATIONS RELATED TO HAZARDOUS MATERIALS

A. The Contractor shall comply with all EPA, OSHA, RCRA, NFPA, CAL-EPA and any other Federal, State, County, City, and other local regulations governing the storage and conveyance of hazardous materials, including petroleum products, for all work included in the Contract Documents.

1.05 DEFINITIONS

A. Unless otherwise stated, the words directed, required, permitted, ordered, instructed, designated, applicable, appropriate, sufficient, proper, desirable, necessary, prescribed, approved, acceptable, satisfactory or words of like import, refer to actions, expressions, and prerogatives of the City or Engineer.

B. Singular words include the plural and "person" includes firms, companies, and corporations.

C. Where used in the Contract Documents, the following words and terms shall have the meanings indicated. The meanings shall be applicable to the singular and plural of the words and terms.

Acceptance - The formal written acceptance by the Owner of an entire work which has been

completed in all respects in accordance with the Contract Documents and any modifications thereof previously approved.

Act of God - An earthquake, flood, cyclone, or other cataclysmic phenomenon of nature. A rain, windstorm, high water, or other natural phenomenon, which might reasonably have been anticipated from historical records of the general locality of the work, shall not be construed as an Act of God. This definition includes the definition of act of God set forth in Section 7105 of the Public Contract Code, where applicable.

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

Agreement - The written contract between the Owner and the Contractor covering the work to be performed; other documents are attached to the agreement and made a part thereof, as provided therein.

Asbestos – Any material that contains more than one-tenth of one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration. Asbestos means fibrous forms of various hydrated minerals, including chrysolite (fibrous serpentine), crocidolite (fibrous riebecktite), amosite (fibrous cummingtonite-grunerite), fibrous tremolite, fibrous actinolite, and fibrous anthophyllite.

Bid - The offer or proposal of the Bidder, submitted on the prescribed forms, setting forth the price or prices for the work.

Bidder - Any properly licensed and qualified individual, firm, partnership, corporation, joint venture, or combination thereof, submitting a proposal for the work contemplated, acting directly or through a duly authorized representative.

Bond(s) - Bid, Performance, or Payment Bonds and other instruments of surety, furnished by the Contractor and Contractor's surety in accordance with the Contract Documents.

Calendar Day - Any day of 24 hours, measured from midnight to the next midnight, including legal holidays, Saturdays and Sundays.

City – City of Morgan Hill.

Complete-In-Place - All items listed within these Specifications as "Complete in Place" shall include furnishing all labor, equipment and materials not specified as furnished by the Owner. The unit price bid shall include, but not be limited to, excavation and backfill, hauling of material, furnishing of thrust blocks, repair of pavement, restoration of structures, and all other work as may be required to complete the installation.

Contract Change Order - A written order to the Contractor, recommended by the Owner, Engineer, or District and signed by the Contractor, Owner and the District, issued on or after the date of the agreement, which authorizes an addition, a deletion or a revision in the work, and which establishes the basis for an adjustment in the Contract Price or the Contract Time for the work affected by the changes.

Contract Documents - The words "Contract Documents" shall mean any or all of, but not limited to, the following items, as applicable:

Notice Inviting Bids
Bid Proposal Forms
Contract Documents
Special Provisions
Standard Specifications
Technical Specifications
Drawings
Addenda, if any
Executed Change Orders, if any
Notice of Award
Notice to Proceed

Each of these items is to be considered by reference as part of the Contract Documents, also referred to as Contract.

Contract Price - The amount payable to the Contractor under the terms and conditions of the Contract based on the price given on the bidding schedule, with adjustments made in accordance with the Contract. The base amount given in the bidding schedule shall be either a lump sum bid or the summation of the unit price bids multiplied by the estimated quantities set forth in the bid form. Also referred to as Contract Amount or Contract Sum.

Contract Time - Number of calendar days stated in the Contract for the completion of the work.

Contract Completion Date - The date on which the Owner accepts the work as being complete.

Contractor - The individual, partnership, corporation, joint-venture, or other legal entity with whom the Owner has executed the agreement.

Contractor's Plant and Equipment - Equipment, material, supplies, and all other items, except labor, brought onto the site by the Contractor to carry out the work, but not to be incorporated in the work.

Day(s) - Calendar Day(s).

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

Design Engineer – Refers to the Engineer, architect, or other entity responsible for developing and certifying the Contract Documents associated with the work.

Direction - Action of the Owner or District by which the Contractor is ordered to perform or refrain from performing work under the Contract.

District – Santa Clara Valley Water District.

Drawings - Refers to the Contract Drawings, profiles, cross sections, elevations, details, and other working Drawings and supplementary Drawings, or reproductions thereof, signed by the Designer, approved by the Owner, and are referred to in the Contract Documents, which show the location, character, dimensions, and details of the work to be performed. The terms drawing, plan and plans have the same meaning as the term Drawings unless otherwise stated or specified. Shop Drawings are not Drawings as defined herein.

Engineer - The Engineer, architect, or scientist designated by the Owner to have design control over the work, or a specified portion of the work, acting through the Owner.

Field Order - A written instruction, given to the Contractor, authorizing work that is a change of the scope of work carried out on a time and material basis.

Float – Float or "total float" shall be defined as provided in the Associated General Contractors of America book "CPM in Construction, A Manual for General Contractors."

Furnish - To deliver to the job site or other specified location any item, equipment, or material.

General Conditions – Part of the Contract Documents representing the general clauses that establishes how the project is to be administered.

General Requirements - Division 1 of the Technical Specifications.

Hazardous Waste – The term Hazardous Waste shall have the meaning provided in California Health and Safety Code Section 25117, as last amended.

Holidays - Legal holidays designated by the Owner or specifically identified in the Contract.

Install – Placing, erecting, or constructing any item, equipment, or material.

Laboratory - The designated materials testing laboratory authorized by the Owner or

District to test materials and work involved in the Contract.

Liquidated Damages - The amount prescribed in the Contract Documents, to be paid to the Owner or to be deducted from any payments due or to become due the Contractor for each day's delay in completing the whole or any specified portion of the work beyond the time allowed in the Specifications.

Milestone – A principal event specified in the Contract Documents relating to an intermediate completion date of a separately identifiable part of the work or a period of time within which the separately identifiable part of the work should be performed prior to Substantial Completion of the work.

Notice of Award - A written notice by the Owner to the Contractor informing it that the Contract has been awarded to the Contractor.

Notice to Proceed - The written notice by the Owner to the Contractor authorizing the Contractor to proceed with the work and establishing the date of commencement of the work.

Owner – City of Morgan Hill.

Owner's Representative - The person designated in writing by the Owner to act as its agent on specified matters relating to this Contract. The Owner's Representative may or may not be the District.

Paragraph - For references or citation purposes, refers to the paragraph(s), called out by paragraph number and alphanumeric designator.

Partial Utilization – Placing a portion of the work in service for the purpose for which it is intended (or a related purpose) before reaching Substantial Completion of all the work.

Person - Includes firms, companies, corporations, partnerships, and joint ventures.

Project - The undertaking to be performed under the provisions of the Contract.

Provide - Furnish and install, complete in place.

Punch List - List of incomplete items of work and of items of work which are not in conformance with the Contract.

Resident Engineer – Authorized representative of the District who is assigned to the site or any part thereof.

Shall - Refers to actions or omissions which are obligations of either the Contractor or the Owner under the Contract Documents.

Shop Drawings – All Drawings, diagrams, illustrations, schedules, and other data which are specifically prepared by or for the Contractor and submitted by the Contractor to illustrate some portion of the work, and all illustrations, brochures, schedules, performance charts, instructions, and diagrams to illustrate material or equipment for some portion of the work.

Shown - Refers to information presented on the Drawings or in the Specifications, with or without reference to the Drawings or the Specifications.

Site - The property as described in the General Conditions or as shown on the Drawings.

Specifications - That part of the Contract Documents consisting of the Invitation to Bid, the Instructions to Bidders, the Bid, General Conditions, Supplementary Conditions, General Requirements, applicable State Standard Specifications, and Technical Specifications.

Specify - Refers to information described, shown, noted or presented in any manner in any part of the Contract.

State of California Specifications - The State of California Department of Transportation Standard Specifications in effect at the time of advertising the work. Also referred to as State Standard Specifications and CALTRANS Standard Specifications.

Subcontractor - A subcontractor is a person or entity who has a direct contract with the Contractor to perform any of the work at the Site. The term subcontractor means a subcontractor or subcontractor's authorized representative. The term subcontractor does not include any separate Contractor or any separate Contractor's subcontractors.

Submittals - The information which is specified for submission to the District in accordance with the Contract Documents

Substantial Completion - Substantial Completion is the stage in the progress of the work when the work is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the work for its intended use. Substantial Completion of the entire work shall mean that as a minimum all of the work has been completed except for those items identified in the Special Conditions.

Sub-subcontractor - A sub-subcontractor is a person or entity who has a direct or indirect contract with a subcontractor to perform any of the work at the Site. The term sub-subcontractor means a sub-subcontractor or an authorized representative thereof.

Supplier - Any person, firm, corporation, or organization who supplies materials or equipment for the work, including that fabricated to a special design, and may also be a Subcontractor or a Sub-subcontractor.

Surety - The person, firm, corporation, or organization that joins with the Contractor in

assuming the liability for the faithful performance of the work and for the payment of all obligations pertaining to the work in accordance with the Contract Documents by issuing the Bonds required by the Contract Documents or by law.

Technical Specifications – Division 1 and subsequent sections of the Contract Documents consisting of the General Requirements and written technical descriptions of products and execution of the work.

Trench Prism – The term "Trench Prism" shall mean the area from bottom of pipe to ground surface the width of the minimum design trench.

Will - Same as Shall.

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

1.06 ABBREVIATIONS

A. Whenever the following abbreviations are used in these Specifications, the intent and meaning shall be interpreted as follows:

AA - Aluminum Association
AAMA - Architectural Aluminum Manufacturer's Association
AAR - Association of American Railroads
AASHTO - American Association of State Highway and Transportation Officials
AATCC - American Association of Textile Chemists and Colorists
ACI - American Concrete Institute
AFBMA - Anti-Friction Bearing Manufacturer's Association, Inc.
AFPA - American Forest Products Association
AGA - American Gas Association
AGMA - American Gear Manufacturers Association
AHA - American Hardboard Association
AHAM - Association of Home Appliance Manufacturers
AI - The Asphalt Institute
AIA - American Institute of Architects
AISC - American Institute of Steel Construction
AISI - American Iron and Steel Institute
AITC - American Institute of Timber Construction
AMCA - Air Moving and Conditioning Association
ANS - American Nuclear Society
ANSI - American National Standards Institute, Inc.
APA - American Plywood Association or American Parquet Association, Inc.

API - American Petroleum Institute
APWA - American Public Works Association
ARI - Air-Conditioning and Refrigeration Institute
ASA - Acoustical Society of America
ASAE - American Society of Agricultural Engineers
ASCE - American Society of Civil Engineers
ASHRAE - American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASLE - American Society of Lubricating Engineers
ASME - American Society of Mechanical Engineers
ASNT - American Society of Nondestructive Testing
ASQC - American Society for Quality Control
ASSE - American Society of Sanitary Engineers
ASTM - American Society for Testing and Materials
AWCI - American Wire Cloth Institute
AWPA - American Wood Preservers Association
AWPI - American Wood Preservers Institute
AWS - American Welding Society
AWWA - American Water Works Association
BBC - Basic Building Code, Building Officials and Code Administrators International
BHMA - Builders Hardware Manufacturer's Association
CABO - Council of American Building Officials
CBM - Certified Ballast Manufacturers
CDA - Copper Development Association
CEMA - Conveyor Equipment Manufacturer's Association
CGA - Compressed Gas Association
CLPCA - California Lathing and Plastering Contractors Association
CLFMI - Chain Link Fence Manufacturer's Institute
CMA - Concrete Masonry Association
CRSI - Concrete Reinforcing Steel Institute
DCDMA - Diamond Core Drill Manufacturer's Association
DHI - Door and Hardware Institute
DIPRA - Ductile Iron Pipe Research Association
EIA - Electronic Industries Association
ETL - Electrical Test Laboratories
EPA - Environmental Protection Agency
FCC - Federal Communications Commission
FCI - Fluid Controls Institute
FM - Factory Mutual System
FPL - Forest Products Laboratory
HI - Hydronics Institute
HPMA - Hardwood Plywood Manufacturers Association
IAPMO - International Association of Plumbing and Mechanical Officials
ICBO - International Conference of Building Officials
IEEE - Institute of Electrical and Electronics Engineers
IES - Illuminating Engineering Society

IME - Institute of Makers of Explosives
IP - Institute of Petroleum (London)
IPC - Institute of Printed Circuits
IPCEA - Insulated Power Cable Engineers Association
ISDSI - Insulated Steel Door Systems Institute
ISA - Instrument Society of America
ISEA - Industrial Safety Equipment Association
ISO - International Organization for Standardization
ITE - Institute of Traffic Engineers
MBMA - Metal Building Manufacturer's Association
MIL - Military Standards (DoD)
MPTA - Mechanical Power Transmission Association
MSS - Manufacturers Standardization Society
MTI - Marine Testing Institute
NAAMM - National Association of Architectural Metal Manufacturer's
NACE - National Association of Corrosion Engineers
NAGDM - National Association of Garage Door Manufacturers
NB - Boiler and Pressure Vessel Inspectors (alternate NBBPVI)
NBS - National Bureau of Standards (Now NIST)
NCCLS - National Committee for Clinical Laboratory Standards
NEC - National Electrical Code
NEMA - National Electrical Manufacturer's Association
NETA - International Electrical Testing Association
NFPA - National Fire Protection Association, or National Fluid Power Association
NFPA - National Forest Products Association
NISO - National Information Standards Organization
NLGI - National Lubricating Grease Institute
NMA - National Microfilm Association
NRCA - National Roofing Contractors Association
NSF - National Sanitation Foundation
NWMA - National Woodwork Manufacturers Association
NWWDA - National Wood Window and Door Association
OSHA - Occupational Safety and Health Administration
PCA - Portland Cement Association
PPI - Plastics Pipe Institute
RCRA - Resource Conservation and Recovery Act
RIS - Redwood Inspection Service
RMA - Rubber Manufacturers Association
RVIA - Recreational Vehicle Industry Association
RWMA - Resistance Welder Manufacturer's Association
SAE - Society of Automotive Engineers
SAMA - Scientific Apparatus Makers Association
SDI - Steel Door Institute
SMA - Screen Manufacturers Association
SMACCNA - Sheet Metal and Air Conditioning Contractors National Association

SPI	-	Society of the Plastics Industry, Inc.
SPIB	-	Southern Pine Inspection Bureau
SPR	-	Simplified Practice Recommendation
SSA	-	Swedish Standards Association
SSBC	-	Southern Standard Building Code, Southern Building Code Congress
SSPC	-	Society for Protective Coating
SSPWC	-	Standard Specifications for Public Works Construction
TAPPI	-	Technical Association of the Pulp and Paper Industry
TFI	-	The Fertilizer Institute
TIA	-	Telecommunications Industries Association
TPI	-	Truss Plate Institute
UBC	-	Uniform Building Code
UPC	-	Uniform Plumbing Code
UL	-	Underwriters Laboratories, Inc.
WCLIB	-	West Coast Lumber Inspection Bureau
WCRSI	-	Western Concrete Reinforcing Steel Institute
WEF	-	Water Environment Federation
WIC	-	Woodwork Institute of California
WRI	-	Wire Reinforcement Institute, Inc.
WWPA	-	Western Wood Products Association

PART 2 - MATERIALS (Not used)

PART 3 - EXECUTION (Not used)

PART 4 – MEASUREMENT AND PAYMENT

No separate payment will be made for Reference Standards, Definitions and Abbreviations. Payment for work in this section shall be included as part of the applicable Lump Sum or Unit Prices stated in other sections.

-END OF SECTION-

SECTION 01565 - TEMPORARY BARRIER FENCING

Bid Item No. 3

PART 1 - GENERAL

1.01 SCOPE

A. This section includes the erection, maintenance, and dismantling of temporary fencing around construction site and materials storage areas. This section does not apply where security fencing is required. Refer to Drawings for temporary fence type, layout, and location of gates.

1.02 SUBMITTALS

A. Submit to be provided in accordance with SECTION 01330 – PROJECT RECORDS AND SUBMITTALS

B. Shop drawing indicating layout of temporary fencing, location and size of gates, existing pavement and roads, access to fire hydrants and hose connections, and other site-specific conditions. Prepare drawing after site observation and verification of existing conditions.

PART 2 - MATERIALS

2.01 TEMPORARY CHAIN LINK FENCING

A. Unless otherwise indicated, type of temporary chain link fencing shall be Contractor's option. Following types are acceptable:

1. New materials or previously used salvaged chain link fencing in good condition.

2. Posts: Galvanized steel pipe of diameter to provide rigidity. Posts shall be suitable for setting in concrete footings, driving into ground, anchoring with base plates, or inserting in precast concrete blocks.

3. Fabric: Woven galvanized steel wire mesh. Provide in continuous lengths to be wire tied to fence posts or prefabricated into modular pipe-framed fence panels.

4. Gates: Provide personnel and vehicle gates of the quantity and size indicated on the Drawings or required for functional access to site.

B. Fabricate of same material as used for fencing.

C. Vehicle gates: Minimum width of twenty feet (20') to allow access for emergency vehicles and capable of manual operation by one person.

2.02 TEMPORARY PLASTIC MESH FENCING

A. Where indicated on Drawings or as required to provide visual warning and control, provide plastic mesh fencing supported by steel posts driven into ground or set in precast concrete blocks. Fencing shall be orange mesh barrier, Tensar or equal.

B. Height: thirty-six inches (36”) minimum

C. Color: Safety Orange

D. Posts: Steel, thirty-six inches (36”) minimum

PART 3 - EXECUTION

3.01 LAYOUT

A. Installation of temporary fencing shall not deter or hinder access to existing and new hose connections and fire hydrants.

   1. Maintain three feet (3’) diameter clear space around fire hydrants.

   2. Provide access gate where fire hydrant or hose connection is blocked by fencing.

   3. Provide gates for personnel, delivery of materials, and access by emergency vehicles.

B. Fencing shall be installed prior to any work taking place at the site. Fencing shall be maintained throughout the life of the project until final completion of the contract.

3.02 CHAIN LINK FENCING INSTALLATION

A. The Contractor shall furnish and install temporary chain link fencing around all protected areas or as specified or delineated on the Drawings and as follows below:

   1. Chain link posts:

      a. Space at ten foot (10’) maximum.
      b. Posts shall be steel, minimum of five feet (5’) in length.
      c. Drive posts, set in holes and backfill, or anchor in precast concrete blocks.
      d. For soft and unstable ground conditions, cast concrete plug around post.
      e. Posts over pavement: Use steel post plates or precast concrete blocks.
      f. Gate posts: Use bracing or concrete footings to provide rigidity for accommodating size of gate.

2. Fabric:

    a. Securely attach to posts.

3. Gates:

    a. Install with required hardware.

3.03 PLASTIC MESH FENCING INSTALLATION

A. Space steel support posts to ensure mesh remains vertical and at proper height.

B. Securely tie mesh to posts.

3.04 MAINTENANCE AND REMOVAL

A. Fencing shall be installed prior to any Work taking place at the site. Fencing shall be maintained throughout the life of the project until final completion of the contract. If damaged, Contractor is required to immediately repair all sections affected.

B. Remove temporary fencing upon completion of Work or when no longer required for security or control. Backfill holes and compact. Holes in pavement shall be surfaced to match existing paving. Repair damage caused by installation of temporary fencing.

PART 4 – MEASUREMENT AND PAYMENT

All work as specified herein, satisfactorily completed, shall be paid for on a Lump Sum basis as stated in **Bid Item Schedule** for the item listed below:

Bid Item No. 3 – TEMPORARY BARRIER FENCING

-END OF SECTION-

SECTION 01600 - DELIVERY, STORAGE AND HANDLING

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This Section specifies the general requirements for the delivery handling, storage and protection for all items required in the construction of the work. Specific requirements, if any, are specified with the related item.

1.02 TRANSPORTATION AND DELIVERY

A. Transport and handle items in accordance with manufacturer's instructions.

B. Schedule delivery to reduce long term onsite storage prior to installation and/or operation. Under no circumstances shall equipment be delivered to the site more than one month prior to installation without written authorization from the Engineer.

C. Coordinate delivery with installation to ensure minimum holding time for items that are hazardous, flammable, easily damaged or sensitive to deterioration.

D. Deliver products to the site in manufacturer's original sealed containers or other packing systems, complete with instructions for handling, storing, unpacking, protecting and installing.

E. All items delivered to the site shall be unloaded and placed in a manner, which will not hamper the Contractor's normal construction operation or those of subcontractors and other contractors and will not interfere with the flow of necessary traffic.

F. Provide necessary equipment and personnel to unload all items delivered to the site.

G. Promptly inspect shipment to assure that products comply with requirements, quantities are correct and items are undamaged. For items furnished by others (i.e. City, other Contractors), perform inspection in the presence of the Engineer. Notify Engineer verbally, and in writing, of any problems.

1.03 STORAGE AND PROTECTION

A. Store and protect products in accordance with the manufacturer's instructions, with seals and labels intact and legible. Storage instruction shall be studied by the Contractor and reviewed with the Engineer by him/her. Instruction shall be carefully followed and a written record of this kept by the Contractor. Arrange storage to permit access for inspection.

B. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with

foreign matter.

C. Cement and lime shall be stored under a roof and off the ground and shall be kept completely dry at all times. All structural, miscellaneous and reinforcing steel shall be stored off the ground or otherwise to prevent accumulations of dirt or grease and in a position to prevent accumulations of standing water and to minimize rusting. Beams shall be stored with the webs vertical. Precast concrete shall be handled and stored in a manner to prevent accumulations of dirt, standing water, staining, chipping or cracking. Brick, block and similar masonry products shall be handled and stored in a manner to reduce breakage, cracking, and spalling to a minimum.

D. All mechanical and electrical equipment and instruments subject to corrosive damage by the atmosphere if stored outdoors (even though covered by canvas) shall be stored in a weather tight building to prevent injury. The building may be a temporary structure on the site or elsewhere, but it must be satisfactory to the Engineer. Building shall be provided with adequate ventilation to prevent condensation. Maintain temperature and humidity within range required by manufacturer.

E. All equipment shall be stored fully lubricated with oil, grease and other lubricants unless otherwise instructed by the manufacturer.

F. Moving parts shall be rotated a minimum of once weekly to ensure proper lubrication and to avoid metal-to-metal "welding". Upon installation of the equipment, the Contractor shall start the equipment, at least half load, once weekly, for an adequate period of time to ensure that the equipment does not deteriorate from lack of use.

G. Lubricants shall be changed upon completion of installation and as frequently as required thereafter during the period between installation and acceptance. New lubricants shall be put into the equipment at the time of acceptance.

H. Prior to acceptance of the equipment, the Contractor shall have the manufacturer inspect the equipment and certify that its condition has not been detrimentally affected by the long storage period. Such certifications by the manufacturer shall be deemed to mean that the equipment is judged by the manufacturer to be in a condition equal to that of equipment that has been shipped, installed, tested and accepted in a minimum time period. As such, the manufacturer will guaranty the equipment equally in both instances. If such a certification is not given, the equipment shall be judged to be defective. It shall be removed and replaced at the Contractor’s expense.

I. Plastic end caps shall be securely fastened to pipe ends of stored pipe for protection of the cement-mortar lining and to prevent introduction of debris or contaminants. End caps shall be maintained in place until time of installation.

PART 2 - MATERIALS (Not used)

PART 3 - EXECUTION (Not used)

PART 4 – MEASUREMENT AND PAYMENT

No separate payment will be made for Delivery, Storage and Handling. Payment for work in this section shall be included as part of the applicable Lump Sum or Unit Prices stated in other sections.

-END OF SECTION-

SECTION 01730 – OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 SCOPE

A. This Section includes procedural requirements for compiling and submitting operation and maintenance data required to complete the project.

1.02 RELATED WORK

A. SECTION 01330 – PROJECT RECORDS AND SUBMITTALS.

B. SECTION 01750 – PROJECT CLOSEOUT.

1.03 SERVICES OF MANUFACTURERS' REPRESENTATIVE

A. Equipment furnished under Divisions 15 and 16 shall include the cost of a competent representative of the manufacturers of all equipment to supervise the installation, adjustment and testing of the equipment and to instruct the City's operating personnel on operation and maintenance. This supervision may be divided into two or more time periods as required by the installation program or as directed by the Engineer.

B. A certificate in the form attached to this Section, from the manufacturer and signed by City's representative stating that the installation of the equipment is satisfactory, that the unit has been satisfactorily tested, is ready for operation and that the operating personnel have been suitably instructed in the operation, lubrication and care of the unit shall be submitted for each piece of equipment indicated above.

C. For equipment furnished under other Divisions, furnish the services of accredited representatives of the manufacturer only when some evident malfunction or over-heating makes such services necessary in the opinion of the Engineer.

1.04 SUBMITTAL SCHEDULE

A. The Contractor shall provide, prior to acceptance of all work, all technical operation and maintenance (O&M) manuals for all portions of work. Six (6) sets of all O&M manuals shall be furnished to the Engineer for review, approval and distribution to the interested parties.

B. Two preliminary copies of manuals with proposed formats and outlines of content shall be submitted to the Engineer for approval within sixty (60) days prior to scheduled startup, for each piece of equipment. The Engineer will review the preliminary draft and return one copy with comments.

1.05 SUBMITTAL FORMAT

A. The manual for each piece of equipment shall be a separate document with the following specific requirements:

1. Contents:

   a. Table of contents and index

   b. Brief description of each system and components

   c. Starting and stopping procedures

   d. Special operating instructions

   e. Routine maintenance procedures and frequency

   f. Manufacturer's printed operating and maintenance instructions, parts list, illustrations and diagrams

   g. One copy of each wiring diagram

   h. One copy of each approved shop drawing and each Contractor's coordination and layout drawing

   i. List of spare parts, manufacturer's price, and recommended quantity

   j. Name, address and telephone numbers of local service representatives.

   k. Beginning date and duration of warranty or service and maintenance contract.

2. Material

   a. Loose leaf on 20 lb punched paper

   b. Holes reinforced with plastic cloth or metal

   c. Page size, 8.5" x 11"

   d. Diagrams, illustrations, and attached foldouts as required, of original quality, reproduced by dry copy method

   e. Covers: oil, moisture and wear resistant 9 by 12 size

1.06 CONTENTS, EACH VOLUME

A. Table of Contents: Provide title of project, names, addresses and telephone numbers of Engineer, subconsultants and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

B. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers; including local source of supplies and replacement parts.

C. Product Data: Mark each sheet to clearly identify specific products and component parts and data applicable to installation. Delete inapplicable information.

D. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance Drawings.

E. Type Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified.

F. Warranty: For all major pieces of equipment, the Contractor shall submit a warranty from the equipment manufacturer. Refer to SECTION 01738 – WARRANTIES AND BONDS for additional warranty requirements.

1.07 MANUAL FOR MATERIALS AND FINISHES

A. Building Products, Applied Materials and Finishes: Include product data, with catalog number, size, composition and color and texture designations. Provide information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods and recommended schedule for cleaning and maintenance.

C. Moisture Protection and Weather Exposed Products: Include product data listing, applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance and repair.

D. Additional Requirements: As specified in individual product Specifications.

E. Provide a listing in Table of Contents for design data, if provided by Contractor, with tabbed fly sheet and space for insertion of data.

1.08 MANUAL FOR EQUIPMENT AND SYSTEMS

A. For each Item of Equipment and Each System provide the following:

1. Overview of System and description of unit or system and component parts. Identify function, normal operating characteristics and limiting conditions. Include performance curves, with engineering data and tests and complete nomenclature and commercial number of replaceable parts.

2. Panelboard Circuit Directories including electrical service characteristics, controls and communications and color-coded wiring diagrams as installed.

B. Operating Procedures: Include start-up, break-in and routine normal operating instructions and sequences; regulation, control, stopping, shut-down and emergency instructions; and summer, winter and any special operating instructions.

C. Maintenance Requirements

1. Routine procedures and guide for troubleshooting; disassembly, repair and reassemble instructions; and alignment, adjusting, balancing and checking instructions.

2. Servicing and lubrication schedule and list of lubricants required.

3. Manufacturer's printed operation and maintenance instructions. One set of six operation and maintenance instructions required must be the originals.

4. Sequence of operation by controls manufacturer.

5. Original manufacturer's parts list, illustrations, assembly Drawings and diagrams required for maintenance.

D. Control diagrams by controls manufacturer as installed.

E. Contractor's coordination Drawings, with color-coded piping diagrams as installed.

F. Charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

G. List of original manufacturer's spare parts, current prices and recommended quantities to be maintained in storage.

H. Test and balancing reports as specified.

I. Additional Requirements: As specified in individual product specification.

J. Provide a listing in Table of Contents for design data, if provided by Contractor, with tabbed fly sheet and space for insertion of data.

PART 2 – MATERIALS (Not Used)

PART 3 – EXECUTION (Not Used)

PART 4 – MEASUREMENT AND PAYMENT

No separate payment will be made for Operation and Maintenance Data. Payment for work in this section shall be included as part of the applicable Lump Sum or Unit Prices stated in other sections.

-END OF SECTION-

EQUIPMENT MANUFACTURER'S CERTIFICATE OF INSTALLATION TESTING AND INSTRUCTION

Owner:_____

Project: _____

Contract No. _____

EQUIPMENT SPECIFICATION SECTION_____

EQUIPMENT DESCRIPTION_____

I_____ , Authorized representative of (Print Name)

_____
(Print Manufacturer's Name)
hereby CERTIFY that_____
(Print equipment name and model with serial No.)

installed for the subject project [has] [have] been installed in a satisfactory manner, [has] [have] been satisfactorily tested, [is] [are] ready for operation, and that Owner assigned operating personnel have been suitably instructed in the operation, lubrication, and care of the unit[s] on Date: _____ Time: _____.

CERTIFIED BY: _____ DATE:_____
(Signature of Manufacturer's Representative)

OWNER'S ACKNOWLEDGMENT OF MANUFACTURER'S INSTRUCTION

[I] [We] the undersigned, authorized representatives of the _____ and/or Plant Operating Personnel have received classroom and hands on instruction on the operation, lubrication, and maintenance of the subject equipment and [am] [are] prepared to assume normal operational responsibility for the equipment:

_____ DATE: _____

_____ DATE: _____

_____ DATE: _____

SECTION 01735 - TRAINING REQUIREMENTS

PART 1 - GENERAL

1.01 SCOPE

A. Furnish all labor, materials, equipment, and incidentals necessary to train City staff on the equipment, products, and systems furnished under these contract documents.

1.02 OBJECTIVE OF TRAINING

A. The objective of the training included under this section shall be to convey the knowledge needed by City operations, maintenance, and engineering staff to safely operate, maintain, and repair the equipment and systems furnished under this work. City staff, who will participate in this training have existing full-time work assignments and this training is an assigned work task. Training shall be focused to the skills and job classifications of the staff attending the classes, e.g., maintenance technician, and electrician. Supporting documentation to assist the instruction learning process and to serve as a source of information to City staff after training shall be provided by Contractor.

1.03 TRAINING LIST

A. Training shall be provided for those systems and equipment as listed in the table below or as otherwise defined in the Specifications.

Equipment	**Related Specification**
Plant Control and SCADA	13450
Vertical Turbine Well Pump and Motor	15130
Chemical Feed System	15140
Valves and Related Appurtenances	15110
Ventilation Systems	15700
Safety Equipment	10440
Motor Control Center Instrumentation Arc Flash Training	Division 16

1.04 GENERAL TRAINING REQUIREMENTS

A. Unless specifically noted otherwise, all training shall be conducted in accordance with the following general requirements.

1. Scheduling of training classes:

Specific classes shall be scheduled a minimum of two weeks in advance to allow City staffing arrangements to take place. The Contractor shall plan training in accordance with the overall project progress schedule. The Engineer must approve and confirm class schedules. All classes shall be scheduled in the project master schedule.

2. **Training classes on each subject:**
   The City shall require only one training class for each subject matter, unless otherwise noted. Times shall be scheduled at the discretion of the Engineer. Classes may need to be performed twice to accommodate operator/attendee shift schedules.

3. **Training class agenda:**
   A class agenda shall be prepared by the business conducting the training and submitted via the Contractor to the Engineer at least one week in advance of the date of the first corresponding class. This draft class agenda shall be submitted in accordance with SECTION 01330 – PROJECT RECORDS AND SUBMITTALS. The agenda shall include a listing of subjects to be discussed, time estimated for each subject, list of documentation to be used or provided to support training, and instructor name. Agendas shall include an allocation of time for City staff to ask questions and discuss the subject matter. The City may request that particular subjects be emphasized and the agenda shall be adjusted to accommodate these requests. Copies of the agenda shall be distributed to each student at the beginning of each training class.

4. **Number of students:**
   It is estimated that 2-4 persons will attend each training class. The City will determine the actual number of attendees. The Engineer will provide an estimated headcount two days prior to the class if requested by the Contractor.

5. **Training location:**
   Unless otherwise noted, all training shall be conducted at the project site. If necessary and appropriate as determined by the Engineer, training shall be conducted at off-site locations as approved by the Engineer.

6. **Instructor qualifications:**
   Instructors shall be completely knowledgeable in the products and systems for which they are providing training, and experienced in conducting classes. Sales representatives are not qualified instructors unless they possess the detailed operating and maintenance knowledge required for proper class instruction. If, in the opinion of the Engineer, the scheduled training was not provided by an appropriately knowledgeable person, such training shall be rescheduled and repeated with a suitable instructor at no additional cost to the City.

7. **Training aids:**
   Each instructor is encouraged to use audio-visual devices, models, charts, and so forth to increase the transfer of knowledge. The business conducting the training shall provide all such equipment (televisions, video cassette recorder/player, projectors, screens, easels, etc.),

models, charts, and so forth for each class. It shall be the responsibility of the business conducting the training to confirm in advance that the classroom will be appropriate for the types of audio-visual equipment to be employed.

8. **Classroom documentation:**
   Prepare a course summary illustrated with copies of visual materials. Distribute one (1) copy to each course attendee and submit four (4) copies to the Engineer. If training is being completed on equipment, systems, or products which are required to provide an operations and maintenance manual under SECTION 01730 – OPERATIONS AND MAINTENANCE DATA, this operations and maintenance manual shall be complete and used during the classroom instruction. The quantity of operations and maintenance manuals required under SECTION 01730 – OPERATIONS AND MAINTENANCE DATA shall be provided and available for classroom use. Supplemental documentation handouts shall be provided to support instruction.

9. **City videotaping, photographing, audio recording, and other documentation of training classes:**
   The City reserves the right to videotape, photograph, audio record, and otherwise document any or all training classes provided under this work. The business(s) conducting the training and the Contractor shall cooperate with the City in making such videotapes, photographs, or audio recordings, which shall remain the exclusive property of the City.

B. The Training Classes shall identify any and all hazardous materials that are required for cleaning and/or maintenance.

PART 2 – MATERIALS (Not used)

PART 3 – EXECUTION (Not used)

PART 4 – MEASUREMENT AND PAYMENT

No separate payment will be made for Training Requirements. Payment for work in this section shall be included as part of the applicable Lump Sum or Unit Prices stated in other sections.

-END OF SECTION-

SECTION 01738 – WARRANTIES AND BONDS

PART 1 – GENERAL

1.01 REQUIREMENTS INCLUDED

A. Compile specified warranties and bonds.

B. Co-execute submittals when so specified.

C. Review submittals to verify compliance with Contract Documents.

D. Submit to the Engineer for review and transmittal to City.

1.02 RELATED REQUIREMENTS

A. Instructions to Bidders: Bid Bonds.

B. Conditions of the Contract: Performance Bond and Payment Bond.

C. Agreement.

D. SECTION 01750 – PROJECT CLOSEOUT

1.03 SUBMITTAL REQUIREMENTS

A. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.

B. Number of original signed copies required: Two each.

C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.

1. Product or work item.

2. Firm, with name of principal, address and telephone number.

3. Scope.

4. Date of beginning of warranty, bond or service and maintenance contract.

5. Duration of warranty, bond or service maintenance contract.

6. Provide information for City's personnel:

    a. Proper procedure in case of failure.

    b. Instances, which might affect the validity of warranty or bond.

7. Contractor, name of responsible principal, address and telephone number.

1.04 FORMS OF SUBMITTALS

A. The Contractor shall prepare submittals in duplicate packets.

B. Format:

1. Size: 8-½ inches × 11-inches, punch sheets for standard 3-post binder.

    a. Fold larger sheets to fit into binders.

2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS". List:

    a. Title of Project.

    b. Name of Contractor.

3. Binders: Commercial quality, three-post binder, with durable and cleanable plastic covers and maximum post width of 2-inches.

1.05 WARRANTY REQUIREMENTS

A. The Contractor shall provide a written warranty to guarantee performance of the entire project, including but not limited to the concrete foundations, chemical treatment equipment, pumping equipment, valves, piping, process control instrumentation, landscaping, paving, electrical work and all other work performed for a period of one (1) year from the date of the recorded Notice of Completion. If any materials or workmanship prove to be defective within one (1) year, they shall be replaced or repaired by the Contractor at no cost to the Owner.

B. The Contractor shall be responsible for obtaining certificates for equipment warranty for all major equipment and which has a 1 HP or larger motor or which lists for more than $1,000. The Engineer reserves the right to request warranties for equipment not classified as major. The Contractor shall still warrant equipment not considered to be "major" in the Contractor's one (1) year warranty period even though certificates of warranty may not be required.

C. For certain pieces of equipment, the City may require a warranty of longer duration. The

requirement for a warranty of longer duration shall be specified in individual sections of the Specifications.

D. The Contractor shall execute and submit the Warranty Submittal prior to the Substantial Completion date or the final acceptance of the project or within five (5) days of the occupancy or use of a portion of the work, whichever is applicable.

PART 2 – MATERIALS (Not used)

PART 3 – EXECUTION (Not used)

PART 4 – MEASUREMENT AND PAYMENT

No separate payment will be made for Warranties and Bonds. Payment for work in this section shall be included as part of the applicable Lump Sum or Unit Prices stated in other sections.

-END OF SECTION-

SECTION 01740 - PRESERVATION AND CLEANUP

Bid Item No. 4

PART 1 – GENERAL

1.01 SCOPE

A. This Section covers the work necessary to preserve, restore and cleanup the project site to its original state**,** when damaged either directly or indirectly by the operations incidental to the construction of the project, complete.

PART 2 – MATERIALS (Not used)

PART 3 – EXECUTION

3.01 PRESERVATION AND CLEANUP

A. The Contractor shall protect all existing utilities, fences, and any other improvements or existing facilities. Any damaged or destroyed improvements or existing facilities shall be replaced to a condition equal to or better than the condition which existed prior to the damage. All repairs to damaged improvements or existing facilities shall receive the approval of the Engineer or City.

B. Stockpile excavated materials in a manner that will cause the least damage to adjacent property, trees, shrubbery, or fences, regardless of whether these are on private property, or on state, city, or county rights-of-way. Remove all excavated materials upon completion and leave the surfaces in a condition equivalent to their original condition.

C. At all times during the work, keep the premises clean and orderly, and upon completion of the work, repair all damage caused by equipment and leave the project free of rubbish or excess materials of any kind.

D. Contractor shall keep all paved roads clean and free of dust, mud, and debris resulting from the Contractor's operations. If mud or debris is tracked to any paved street the Contractor shall promptly utilize whatever means are necessary to return the pavement to a clean condition.

3.02 EXISTING TREES AND SHRUBS

A. The Contractor shall take all necessary precautions to not damage or remove any of the existing trees or shrubs that are to remain. Trees and shrubs that are to remain may be flagged in the field. The Contractor shall immediately notify the Engineer if any tree or shrub is damaged by the Contractor's construction operations.

B. Trees or shrubs that are to remain on the site shall not be trimmed without the approval of the Engineer. If trimming is approved, then the symmetry of the tree shall be preserved, no stubs or splits or torn branches shall be left. All cuts shall be made close to the trunk or large branch. Cuts over 1 ½- inches in diameter shall be coated with a tree paint product that is waterproof, adhesive, and elastic, and free of materials that would injure the tree.

C. Damaged trees or shrubs shall be replaced if in the opinion of the Engineer such replacement is necessary. The trees or shrubs shall be of like size and variety. The minimum size of any replacement tree shall not be less than 1-inch in diameter nor less than 6 feet high.

3.03 EROSION AND SEDIMENT CONTROL

A. Storm Water Pollution Prevention Plan (SWPPP)

The Contractor shall submit a SWPPP to the State Regional Water Quality Control Board (SWRCB) that addresses all of the required elements as stated in the latest Construction General Permit Order, and as outlined in this specification. In order to obtain coverage under the General Permit, the Contractor shall submit a Notice of Intent (NOI) with a wet signature along with a site map and fee to the Storm Water Unit in the SWRCB.

The SWPPP shall contain a site map(s) which shows the construction site perimeter, existing and proposed buildings, lots, roadways, stormwater collection and discharge points, general topography both before and after construction, and drainage patterns across the project. The SWPPP must list Best Management Practices (BMPs) the discharger will use to protect storm water runoff and the placement of BMPs. Additionally, the SWPPP must contain a visual monitoring program; a chemical monitoring program for pollutants to be implemented if there is a failure of BMPs; and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment. Section A of the Construction General Permit describes the elements that must be contained in a SWPPP. Contractor shall pay all fees associated with development and implementation of the SWPPP.

The Contractor shall submit the Storm Water Pollution Prevention Plan (SWPPP) for approval by the Engineer which details the placement of physical BMPs required for installation and the methods used to comply with those BMPs directed at operational procedures. A copy of the SWPPP must be submitted to the SWRCB prior to conducting any construction activity.

The SWPPP shall be in place before construction activity may start. In order to establish verification of delivery, Contractor shall send the NOI with a receipt request to the SWRCB. The NOI should be sent at least two weeks prior to the start of construction to allow processing of the NOI and assignment of a Waste Discharge Identification Number (WDID No.).

The Contractor must submit a Wet Weather Erosion Control Plan (WWECP) to the SWRCB if any portion of the construction schedule and area of soil disturbance occurs between November 1 and April 15.

The Contractor shall provide the City with a copy of the SWPPP, NOI, WDID No. and

WWECP.

B. General Requirements

Temporary erosion control shall consist of, but not be limited to, constructing such facilities and taking such measures as are necessary to prevent, control, and abate water, mud, construction materials, hazardous materials and erosion damage to public and private property as a result of the Contractor's operations.

During initial mobilization of the project the temporary erosion control features as are necessary to prevent damage during forthcoming winter season shall be constructed and functioning. If the earthwork in any area has not progressed to a point where any part of the facilities on the temporary erosion control plans for that area can be constructed, the Contractor shall construct such supplementary temporary erosion control facilities as are necessary to protect adjacent private and public property.

Conformance with the requirements of this section shall in no way relieve the Contractor from the Contractor's responsibilities, as provided in Section 13 "Water Pollution Control" and Section 5-1.36 "Preservation of Property" of the Caltrans Standard Specifications.

Conformance with the requirements of this section shall in no way relieve the Contractor from the Contractor's responsibilities, as provided in Section 7-1.01G, "Water Pollution," Section 7-1.11, "Preservation of Property," of the Caltrans Standard Specifications.

Contractor shall employ applicable best management practices to perform all work under the project contract in a safe and efficient manner and which protects the environment. The best management practices shall not be limited to the requirements set forth in this Section.

The Contractor shall maintain the temporary erosion control features throughout the duration of the project. Repairs, sediment cleanup, and disposal will be at no additional cost to the City.

Temporary erosion control measures shall include, but not be limited to, the following:

1. The Contractor shall conduct operations in such a manner that storm runoff will be contained within the site or channeled into the storm drain system which serves the runoff area. Storm runoff from one area shall not be allowed to divert to another runoff area.

2. Storm drain systems, toe of slope drains, and outlet structures shall be constructed and operating prior to commencing, or concurrently with placing an embankment. Temporary downdrains, drainage structures, and other devices shall be provided to channel storm runoff water into the respective permanent storm drain systems during construction. Mud and silt shall be settled out of the storm runoff before the runoff enters the storm drain system.

3. Embankment areas, while being brought up to grade and during periods of completion prior to final roadbed construction, shall be protected by various measures to eliminate erosion

and the siltation of downstream facilities and adjacent areas. These measures may include, but shall not be limited to: temporary downdrains, either in the form of pipes or paved ditches with protected outfall areas; graded berms around areas to eliminate erosion of embankment slopes by surface runoff; confined ponding areas to de-silt runoff; and temporary check dams in toe of slope ditches to de-silt runoff.

4. Excavation areas, while being brought to grade, shall be protected from erosion and the resulting siltation of downstream facilities and adjacent areas by use of various temporary erosion control measures. These measures may include, but shall not be limited to: check dams; confined ponding areas to de-silt the runoff; and protection, such as sandbags around inlets which have not been brought up to grade.

5. Contour graded areas shall be protected against erosion and the resulting siltation of downstream facilities and adjacent areas during grading operations. Various measures may include, but shall not be limited to: the use of graded contour berms to control sheet flow; supplemental grading of large areas around temporary or unfinished inlet structures to provide de-silting basins; and temporary ditch paving.

6. During embankment construction, an earth berm or appropriate grading to direct drainage away from the edge of the top of the embankment shall be constructed and maintained on those embankments where earthwork operations are not in progress.

7. Special attention will be required to protect areas, which have been cleared, and grubbed prior to excavation or embankment operations, and which are subject to runoff. Temporary measures may include, but shall not be limited to: temporary de-silting basins; contour graded ditches; temporary paved and unpaved ditches; and filter fabric fences to contain silt and sediment from runoff.

8. After each storm, de-silting basins shall be checked against their design capacity and if necessary, silt and sediment shall be removed to restore capacity.

9. Construction vehicles and equipment entering existing paved areas shall be free of mud, silt and other debris during all phases of work. No mud, silt and other debris shall be tracked on paved surfaces. If such materials are tracked on the streets or other paved areas both public and private, the Contractor shall immediately remove these materials prior to these materials entering into the storm drain system.

10. Stockpiling of materials on the street will not be allowed unless otherwise approved by the Engineer. The Contractor shall cover with plastic any construction or excavated materials which may possibly erode and enter the storm drain system of paved streets or other paved areas both public and private. Stockpiling of dirt on paved areas will not be allowed.

11. The Contractor shall sweep the work area and clean up the work site daily before leaving the site. Hosing down the street is not allowed.

C. Inspection and Maintenance

To ensure the proper implementation and functioning of temporary erosion control measures, the Contractor shall regularly inspect and maintain the construction site for the control measures identified in the Drawings and in. The Contractor shall identify corrective actions and time frames to address any damaged measures or reinitiate any measures that have been discontinued.

Inspections of the construction site shall be conducted by the Contractor to identify deficient measures, as follows:

1. Prior to a predicted storm;

2. After all precipitation which causes runoff capable of carrying sediment from the construction site;

3. At 24 hour intervals during extended precipitation events; and

4. Routinely, on a minimum twice monthly basis.

If the Contractor identifies a deficiency in the deployment or functioning of an identified control measure, the deficiency shall be corrected in a timely manner. If the Engineer identifies a deficiency in the deployment or functioning of an identified control measure, the Contractor will be notified in writing and the deficiencies shall be corrected by the Contractor in a timely manner.

3.04 PAVEMENT RESTORATION

A. All paved areas that are outside of the areas to be re-paved or demolished which are damaged during construction shall be replaced with similar materials of equal thickness to match existing undamaged adjacent areas, including base and subbase. Pavements that are to be partially removed shall be neatly saw cut in straight lines to provide a clean, sound, vertical joint.

3.05 SITE RESTORATION

A. Upon completion of the project, all areas used by the Contractor shall be properly cleared of all temporary structures, rubbish, and waste materials and properly graded to drain and blend with abutting properties. Areas used for the deposit of waste materials shall be furnished to properly drain and blend with the surrounding terrain.

PART 4 – MEASUREMENT AND PAYMENT

All work as specified herein, satisfactorily completed, shall be paid for on a Lump Sum basis as stated in **Bid Item Schedule** for the item listed below:

Bid Item No. 4 – PRESERVATION AND CLEANUP

-END OF SECTION-

SECTION 01750 – PROJECT CLOSEOUT

Bid Item No. 5

PART 1 - GENERAL

1.01 SCOPE

A. This Section specifies the administrative and procedural requirements for project closeout, including, but not limited to:

1. Closeout procedures
2. Final cleaning
3. Adjusting
4. Project as-built documents
5. Spare parts and maintenance materials

1.02 RELATED WORK

A. SECTION 01330 – PROJECT RECORDS AND SUBMITTALS

B. SECTION 01730 – OPERATION AND MAINTENANCE DATA

C. SECTION 01738 – WARRANTIES AND BONDS

1.03 AS-BUILT DOCUMENTS

A. Maintain on site, at least one set of the following documents; actual revisions to the work shall be recorded in these documents:

1. Contract Drawings
2. Specifications
3. Addenda
4. Change Orders and other Modifications to the Contract
5. Reviewed Shop Drawings, product data, and samples

B. Store As-Built Documents separate from documents used for construction

C. Record information concurrent with construction progress

D. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:

1. Manufacturer's name and product model and number

2. Product substitutions or alternates utilized

3. Changes made by Addenda and Modifications

E. Contract Drawings and Shop Drawings: Legibly mark each item to record actual construction including:

1. Measured depths of foundations in relation to finish floor datum.

2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the work.

4. Field changes of dimension and detail.

5. Details not on original Contract Drawings.

1.04 FINAL CLEANUP

A. The Contractor shall cleanup the project site as indicated in SECTION 01740 – PRESERVATION AND CLEANUP, and this specification. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion:

1. Remove labels that are not permanent labels.

2. Remove of all debris resulting from construction practices and accumulated trash, properly disperse of all excess cut or fill material, and filling in any holes that may be present on the site.

3. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compound and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.

4. Clean exposed exterior and interior hard - surfaced finishes to a dust - free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original

reflective condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.

5. Wipe surface of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.

6. Clean the site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.

7. The Contractor shall remove all construction equipment, supplies, and all waste materials used in the performance of his work. Removal of items from the site include but are not limited to all rubbish, unused materials, concrete forms, construction equipment, temporary structures, and facilities used during construction.

8. The Contractor shall restore the ground surface around the project site to conditions, as they existed prior to the start of work, and grade such to ensure adequate drainage.

1.05 FINAL SUBMITTALS

A. The Contractor shall submit the following items to the Engineer upon substantial completion of the project, for review: Final payment will be withheld until all items are submitted and approved by the Engineer.

1. Manufacturers' and suppliers' written, instructions, warranties and guarantees.

2. Technical and Operation and Maintenance manuals.

3. As-Built Drawings.

4. New permanent cylinders and key blanks for all locks.

5. Parts list, spare parts, and any special tools.

6. Bonds for maintenance, as required.

1.06 CLOSEOUT PROCEDURES

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

B. Provide submittals to City that are required by governing or other authorities.

C. Submit Application for Final Payment identifying total adjusted Contract Sum, previous payments and sum remaining due.

PART 2 – MATERIALS (Not used)

PART 3 – EXECUTION (Not used)

PART 4 – MEASUREMENT AND PAYMENT

All work as specified herein, satisfactorily completed, shall be paid for on a Lump Sum basis as stated in **Bid Item Schedule** for the item listed below:

Bid Item No. 5 – PROJECT CLOSEOUT

-END OF SECTION-

SECTION 02200 – DEMOLITION, CLEARING, GRUBBING AND STRIPPING

Bid Item No. 6

PART 1 - GENERAL

1.01 SCOPE

A. This section covers the work necessary to demolish, clear, grub, and strip the project site of the, concrete, asphalt concrete, curbs, paths, trees, shrubbery, boulders, underground utilities, etc.

1.02 RELATED WORK

A. SECTION 01740 – PRESERVATION AND CLEANUP

1.03 SITE CONDITIONS

A. The Contractor shall conduct site visits as needed to determine the extent of the work required to demolish, clear, grub and strip the site.

PART 2 - MATERIALS (Not used)

PART 3 - EXECUTION

3.01 CLEARING AND GRUBBING

A. All isolated surface vegetation and any miscellaneous surface obstructions shall be removed from the project area, prior to any site grading. Surface stripping should not be incorporated into fill unless they can be sufficiently blended to result in an organic content less three (3) percent by weight (ASTM D2974). Stripped topsoil, with all organic content between three (3) and twelve (12) percent by weight, may be stockpiled and used as non-structural fill (i.e. landscaped areas). If used in landscaped areas, soil with an organic content between three (3) and twelve (12) percent should be placed within two (2) feet of finished grade and at least five (5) feet outside the perimeter of buildings or improvements. Soil with an organic content greater than twelve (12) percent by weight should be excluded from fill.

B. Where clearing or partial clearing of the right-of-way is necessary, complete prior to the start of construction of facilities or structures. Remove and dispose of all vegetation designated for removal as indicated on the Drawings and as flagged in the field. Include shrubs, brush, downed timber, rotten wood, heavy growth of grass and weeds, vines, rubbish and debris. Vegetation removal shall include the root ball and all surface roots larger than one-half (1/2) inch in diameter. Areas where trees and shrubs have been removed shall be thoroughly cross-ripped to a depth of twelve (12) inches to expose any remaining rubble, debris, and root structures. Cross ripping operations shall be performed in the presence of the Engineer. Cut trees and brush as near

to the surface to the ground as practical, remove all stumps, and pile for disposal. Do not permit excavated materials to cover brush or trees prior to disposal.

C. Excavations and depressions resulting from the removal of such items, as well as any existing excavations or loose soil deposits, as determined by the Engineer, shall be cleaned out to firm, undisturbed soil and backfilled with suitable material in accordance with these Specifications.

D. Protect from damage the existing trees and other vegetation that are to remain, as specified in this section and in SECTION 01740 – PRESERVATION AND CLEANUP. Do not smother trees by stockpiling construction materials or excavated materials within the drip line and provide temporary protection as required.

E. Do not remove existing trees or tree limbs over two (2) inches in diameter whether on public or private property unless they are within four (4) feet of the pipe centerline or pump station building without permission from the Engineer. Limb removal shall be performed only when directed by the Engineer. All authorized limb removal shall be in accordance with the International Society of Arboriculture "Tree Pruning Guidelines." "Heading" of any tree will not be permitted nor the use of climbing spurs on trees that are to remain.

F. Protect from damage, unless otherwise marked by the Engineer, all trees, shrubs, or plants within the limits of the easement on private or public property. Ornamental and exotic trees and shrubs that interfere with trenching shall be replaced in kind and size or may be removed intact with their root system upon approval of the Engineer. Ball the root system of the trees, shrubs, or plants, bind in burlap, heel into topsoil, and keep watered as required. Upon completion of the pipe laying and backfilling of the trench, replant the trees, shrubs, or plants in their original position. The Contractor shall record the location of any plant prior to its removal. Should any tree, shrub, or plant that has been disturbed as a result of its removal, or otherwise damaged by the Contractor, die within one (1) year after the acceptance of the project, it shall be replaced in kind and size by the Contractor at his expense.

G. The Contractor shall remove all unknown underground structures or debris that may be encountered within the limits of construction.

H. If underground tanks, or stained or discolored soil, or oily or odorous water or materials that could present a threat to human health or the environment are discovered during construction, activities in that immediate area shall cease. A qualified environmental consultant shall be hired by the City to evaluate the find and make recommendations. The expenses to the Contractor for performing any required mitigation measures will be added to the Contract Price as a change order. However, if the Contractor is the cause of the environmental spill or hazard then the Contractor shall be responsible for all costs associated with hiring a consultant and any clean-up costs, including disposal.

3.02 DISPOSAL

A. The Contractor shall bear all costs of disposing of all demolished materials including but not limited to trees, stumps, brush, roots, limbs, and other organic/inorganic waste materials from the demolition, clearing and grubbing operation. Debris shall be disposed of in such a manner as to meet all requirements of the State, County, and local regulations regarding health, safety, and public welfare, and shall be properly disposed of off-site. Burning or burying of debris is not permissible and shall not be allowed.

PART 4 – MEASUREMENT AND PAYMENT

All work as specified herein, satisfactorily completed, shall be paid for on a Lump Sum basis as stated in **Bid Item Schedule** for the item listed below:

Bid Item No. 6 – DEMOLITION, CLEARING, GRUBBING AND STRIPPING

-END OF SECTION-

SECTION 02300 - EARTHWORK

Bid Item No. 7

PART 1 - GENERAL

1.01 SCOPE

A. The work shall consist of performing all operations necessary to excavate all materials, regardless of character, subsurface conditions and of whatever nature, necessary for the construction of the footings and foundation for the structures. This section includes work necessary to excavate, place, fill, remove and dispose of all excess and unsuitable materials as required by the Engineer, and to establish site grades as shown on the Contract Drawings. Excavation includes grading for earthen embankments, facilities, pads, roadways, and areas adjacent to structures, slope rounding, and removal of unsuitable material from the roadbed and beneath fill areas. All work shall be in accordance to the recommendations provided in the Geotechnical Report Appendix A.

1.02 RELATED WORK

A. SECTION 02200 – DEMOLITION, CLEARING, GRUBBING, AND STRIPPING

B. SECTION 02320 – TRENCH EXCAVATION AND BACKFILL

1.03 GEOTECHNICAL REPORT

A. A Geotechnical Engineering Report: Morgan Hill Well Projects, January 22, 2016 has been prepared for this site by Wallace Kuhl & Associates, West Sacramento, (916) 372-1434. A copy is located in Appendix A. The Contractor is responsible for any conclusions the Contractor draws from the report; should the Contractor prefer not to assume such risk, the Contractor shall employ his own experts to analyze available information or undertake additional subsurface exploration, at no cost to the City. The Contractor shall notify the Engineer and receive the Engineers' approval for any subsurface exploration a minimum of one week prior to beginning any such work. In addition, the Contractor shall notify USA a minimum of 48-hours prior to beginning any subsurface explorations. If there is any discrepancy between the Contractor's experts and the City's Geotechnical representative, the Contractor shall promptly notify the Engineer, prior to beginning any work.

B. In resolving conflicts resulting from errors or discrepancies between this specification and the Geotechnical Report, the Geotechnical Report shall govern over this specification.

1.04 DEFINITIONS

A. Relative Compaction (ASTM Method)
The ratio expressed as a percentage, of the dry density of the backfill material as compacted

in the field, to the maximum dry density of the same material determined in the laboratory by ASTM D1557.

B. Optimum Moisture Content (ASTM Method)
The ratio, expressed as a percentage, of the weight of water in the solid material to the weight of the solids, which occurs at the maximum dry density as determined by ASTM D1557.

C. Optimum Moisture Content (CALTRANS Method)
The ratio, expressed as a percentage, of the weight of water in the solid material to the weight of the solids, which occurs at the maximum dry density as determined by CALTRANS Test Method 219.

D. Well-Graded
Well-graded as used in this section defines a mixture of particle sizes that have no specific concentration or lack thereof of one or more sizes. Well-graded does not define any numerical value that must be placed on the coefficient of uniformity or any other specific grain size distribution parameters. Well-graded is used to help define a material type that, when compacted, produces a strong and relatively incompressible soil mass free from detrimental voids.

1.05 SUBMITTALS

A. The Contractor shall provide Certifications that all materials to be used on the project meet the requirements of the standards referenced.

B. Samples and a list of the source of the samples of all imported materials to be used shall be submitted two (2) weeks in advance of use. Samples shall consist of one-half cubic feet (0.5 ft^3) of each type of material.

C. Filter fabric data submitted shall include:

1. A 12-inch square of fabric
2. Manufacturer's descriptive product data
3. Installation instructions

1.06 PROJECT CONDITIONS

A. Maintain fills, slopes, and ditches within the limits of the new construction until final acceptance. Repair areas damaged as a result of storms or construction. Take necessary precautions to prevent the entrance of soils and other materials into streambeds, lakes, or watercourses.

1.07 NOTIFICATION

A. Earthwork shall not be performed without the notification and approval of the Engineer. The

Contractor shall notify the Engineer at least two (2) working days prior to the commencement of any aspect of the site earthwork.

PART 2 – MATERIALS

2.01 NATIVE MATERIAL

A. Native material is the on-site, unclassified material or soil. When used it shall be free from peat, wood, roots, bark, and other debris and extraneous material. The native soil may be used in accordance with the Geotechnical Report. The native soil used shall not contain rock or cemented clods in excess of three inches (3") in diameter. The Contractor may be required to moisture condition (i.e. drying and/or wetting of soil) the native soil to achieve the specified compaction. Moisture conditioning and compaction requirements are found in the Geotechnical Report, located in the Appendix, and shall be adhered to in order to reduce the potential for differential movement resulting from the expansive soils to normally tolerable levels. Any work/costs related to drying, wetting, and compacting the native material shall be the responsibility of the Contractor and of no expense to the City.

2.02 IMPORTED FILL SOIL

A. Imported fill soils shall conform to all criterions found in the Geotechnical Report. The soil shall have the following properties:

1. All fill particles shall be less than three inches (3") in size.

2. The fill material shall have a Plasticity Index (PI) no greater than 15.

3. The fill material shall contain less than three percent (3%) by weight of organics, in accordance with ASTM D2974 and shall be free of other objectionable material (concrete, plastic, metal, and other wastes).

2.03 SUBGRADE

A. The subgrade shall be Class 3, in accordance with CALTRANS Standard Specification, Section 25 and as specified herein.

2.04 IMPORTED TOPSOIL

A. Imported topsoil shall be suitable sandy loam from an approved source, which possesses friability and a high degree of fertility. It shall be free of clods, roots, gravel, and other foreign material. It shall be free of noxious vegetation and seed. Imported topsoil shall be obtained and transported at the Contractor's expense.

2.05 STRUCTURAL BACKFILL

A. The material used to backfill footings, foundations, walls, pipes, culverts and conduits shall conform to the following requirements.

1. The material shall have a Sand Equivalent value less than 20.

2. The backfill must be free of organic or unsatisfactory material as deemed by the Engineer.

3. The backfill shall conform to the following grading:

Sieve Size	Percent Passing
1”	100%
No. 4	35%-100%
No. 30	20%-100%
No. 200	2%-5%

2.06 CRUSHED ROCK

A. Crushed rock shall consist of durable rock and gravel that is free of deleterious material and free of slaking or decomposition under the action of wetting or drying and meet the following requirements:

1. The crushed rock must have a minimum Cleanliness Value of 60 as determined by California Test Method 227.

2. Material shall contain at least seventy-five percent (75%) of particles having 2 or more fracture faces.

3. The durability index shall be 40 or greater.

4. The crushed rock shall conform to the following gradation:

Sieve Size	Percent Passing
1”	100%
3/4"	75%-100%
1/2"	5%-55%
3/8”	0%-15%
No. 4	0%-10%
No. 200	0%-2%

2.07 AGGREGATE BASE

A. Aggregate base shall be Class 2, meet the requirements of ASTM D2940, CALTRANS Section 26, and conform to the following requirements:

1. The aggregate base shall be free from organic matter and other deleterious substances, and shall be of such nature that it can be compacted readily under watering and rolling to form a firm, stable base.

2. Aggregate may include material processed from reclaimed asphalt concrete, Portland cement concrete, lean concrete base, cement treated base or a combination of any of these materials. The amount of reclaimed material shall not exceed 50-percent of the total volume of the aggregate used.

3. The aggregate must have a minimum 22 Sand Equivalent, minimum 35 Durability Index, and minimum 78 Resistance (R-Value).

4. The aggregate base shall conform to the following gradation:

Sieve Size	Percent Passing
1”	100%
¾”	87%-100%
No. 4	30%-65%
No. 30	5%-35%
No. 200	0%-12%

PART 3 - EXECUTION

3.01 GENERAL

A. All work shall comply with the CALTRANS Standard Specification, Section 19 and unless otherwise noted in the following provisions:

1. Surplus Material

Unless otherwise noted, surplus excavated material shall be disposed of offsite in accordance with applicable ordinances, environmental requirements, and in accordance with CALTRANS Standard Specification Section 19-2.03B. All costs related to the hauling and disposal of surplus material shall be at no additional cost to the City.

Unless otherwise noted, surplus excavated material shall be disposed of offsite in accordance with applicable ordinances, environmental requirements, and in accordance with CALTRANS Standard Specification Section 7-1.13. All costs related to the hauling and disposal of surplus material shall be at no additional cost to the City.

2. Hauling

When hauling is done over highways or city streets, the loads shall be trimmed and the vehicle shelf areas shall be cleaned after each loading. The loads shall be watered after trimming to eliminate dust, tarped, and transported pursuant to local requirements.

3. **Erosion Control**
   The Contractor shall maintain earthwork surfaces true and smooth and protected from erosion. Where erosion occurs, the Contractor shall provide fill or shall excavate as necessary to return earthwork surfaces to the grade and finish specified.

4. **Ground Water**
   The geotechnical investigation of the site did not encounter groundwater at a boring depth of 20 feet. Historical data shows that groundwater has appeared at 16-feet below the ground surface at the well or as deep as about 56 feet below the ground surface of the well.

5. **Control of Water**
   If water is encountered, the Contractor shall furnish, install, maintain and operate all necessary machinery, appliances and equipment to keep the excavation reasonably free from water until the placing of the bedding material, pouring of concrete, and placing of the backfill has been completed, inspected and approved, and all danger of flotation and other damage is removed. Ground water pumped from the excavation shall be disposed of in such a manner as to not cause injury to public or private property or constitute a nuisance or menace to the public, and the disposal method shall be subject to the approval of the Engineer.

   Surface water shall be diverted or otherwise prevented from entering excavations to the greatest extent possible without causing damage to adjacent property.

   The Contractor shall be responsible for the condition of any pipe or conduit which they may use for drainage purposes, and all such pipe or conduit shall be left clean and free of sediment.

6. **Seasonal Limits**
   Fill material shall not be placed, spread or rolled during unfavorable weather conditions, as determined by the Engineer. If work is interrupted by heavy rains, fill operations shall not resume until field tests indicate that the moisture content of the subgrade and fill materials are satisfactory.

7. **Finish Grading**
   Finished grading shall be smooth, compacted and free from irregularities. The degree of finish shall be that normally obtainable with a blade-grader.

   Finished grade shall be as specified in the Drawings plus or minus 0.10-feet except where a local change in elevation is required to match sidewalks, curbs, manholes, and catch basins, or to ensure proper drainage. Allowance for topsoil and grass cover, and sub base and pavement thickness shall be made so that the specified thickness of topsoil or pavement can be applied to attain the finished grade.

   If the soil is to be cultivated or straw is to be incorporated into the surface, rocks larger

than shall be removed and disposed of prior to cultivation or placement of straw.

8. **Classification of Excavated Materials**
   No classification of excavated materials will be made. Excavation shall include the removal and subsequent handling of all materials excavated or otherwise removed in performance of the work, regardless of the type, character, composition, or condition thereof.

3.02 COMPACTION TESTING

A. The Contractor shall make all necessary excavations for compaction tests. Costs of excavation, backfilling, and compacting in connection with compaction testing shall be borne by the Contractor. The City will pay for compaction testing. The Contractor shall be responsible for payment of any corrective work and testing resulting from an initial failed test.

B. After areas has been excavated and scarified, the area shall be diced or bladed until uniform and free from large clods, and brought to the proper moisture content before compaction. Measurement of compaction will be determined by using the ASTM D1557 Compaction Test Method.

C. Field tests of compacted density will be in accordance with CALTRANS 216 (sand cone) or 231 (nuclear gage) at the Engineer's option.

3.03 EXCAVATION

A. Initial site grading should include a reasonable search to locate soil disturbed by previous activities, any undocumented fill soils, abandoned underground structures, or existing utilities that may exist within the area of construction. Any areas or pockets of soft or loose soils, saturated soils, void spaces made by burrowing animals, or other disturbed soil that are encountered, shall be excavated to expose firm native material. Excavations for removal of any unsuitable conditions should be backfilled with Imported Fill Soil or Structural Backfill.

B. The native soils at the project site should provide adequate bearing strength for the proposed scope of construction, therefore, the recommendations provided in the Geotechnical Report and those included herein are followed, no general over-excavation is needed.

C. The bottoms of all areas to receive fill shall be scarified to a minimum depth of eight inches (8"), uniformly moisture conditioned, proof rolled to detect soft or pliant areas, and compacted to the requirements for Imported Fill Soil or Structural Backfill.

D. When the moisture content of the sub grade is below the optimum moisture content, water shall be added until the proper moisture content is reached. When the moisture content is too high to permit the specified compaction to be achieved, then the sub grade shall be aerated by blading or other methods until the moisture content is satisfactory for compaction.

E. Compaction operations shall be performed in the presence of the Engineer who will evaluate the performance of the materials under compactive load. Unstable soil deposits, as determined by the Engineer, shall be excavated to expose a firm base and the grades restored with Imported Fill Soil or Structural Backfill in accordance with these Specifications.

3.04 UNSUITABLE MATERIAL

A. When unsuitable material is encountered during the grading operation, which would prevent the material from being compacted as specified, the Engineer may order the site to be ripped a minimum of one foot (1') deep and three feet (3') wider than the finish lines, where applicable, and left to dry. In this event a time extension shall be granted for every working day delay for drying. No other consideration or cost shall be given for ripping, delay or stand-by and shall be considered as included in this item of work and no additional compensation will be allowed therefore.

B. Once underground installations are completed and prior to placing imported material on the site, the grading and compaction of the top half foot (0.5') of subgrade and any other material and area's disturbed by trenching, backfilling and/or other work shall be reworked, graded, and compacted to meet the above site grading requirements to receive the imported material.

3.05 AREA BACKFILL

A. The site shall be graded to the lines and grades shown on the plans and in accordance with Section 19-2 of the CALTRANS Standard Specifications and these special provisions.

B. Area Backfill is defined for all areas not covered under trench backfill, structural backfill, or roadway backfill. Area Backfill shall be constructed to the lines and grades as shown on the Drawings as directed by the Engineer, and shall conform to Section 19 of the CALTRANS Standard Specifications and these Specifications, except that ponding and jetting shall not be allowed. Backfill shall consist of on-site or imported engineered fill and shall be brought to the optimum moisture content.

   Area Backfill shall be constructed to the lines and grades as shown on the Drawings as directed by the Engineer, and shall conform to Section 19-3.06 of the CALTRANS Standard Specifications and these Specifications, except that ponding and jetting shall not be allowed. Backfill shall consist of on-site or imported engineered fill and shall be brought to the optimum moisture content.

C. On-site or imported engineered fill shall be placed in horizontal lifts not to exceed six-inches in compacted thickness. Each layer shall be spread evenly and shall be thoroughly mixed during the spreading to promote uniformity of material in each layer.

D. When the moisture content of the fill material is below the optimum moisture content, water shall be added until the proper moisture content is reached. When the moisture content is too

high to permit the specified compaction to be achieved, then the fill material shall be aerated by blading, discing, or other methods until the moisture content is satisfactory for compaction.

E. After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to a minimum of ninety percent (90%), as determined by ASTM D1557. Compaction shall be accomplished while the fill material is at the required moisture content. Moisture content shall be uniform throughout each layer. Each layer shall be compacted over its entire area until the desired density has been obtained.

F. Compaction tests and acceptance by the Engineer will be required prior to the starting of trenching or excavating for placing any underground facilities.

3.06 STRUCTURAL BACKFILL

A. Place structural backfill around structures. Do not exceed loose lifts of eight inches (8”). Compact each lift to at least ninety-five percent (95%) relative compaction. Stop structural backfill six inches (6”) below finished grade in all areas where topsoil is to be placed. Place material in a manner that avoids segregation.

B. Any subsequent damage to slabs, piping, concrete structures, facilities, or structures caused by settlement of structural backfill shall be corrected and repaired by the Contractor at no cost to the City.

3.07 ROADWAY SUBGRADE

A. Subgrades for roadways shall conform to CALTRANS Standard Specifications, Section 25 and these specifications. Prior to any underground work, other than removal of structures, concrete, culverts, piping, conduits or other facilities to be removed, all clearing, stripping, excavating, and grading shall be completed to subgrade of the lowest grading plane to receive imported material (i.e. sub base, base, or concrete). Subgrades shall be constructed to the lines and grades as shown on the Drawings.

B. Prior to backfilling, the subgrade surface shall be bladed or trimmed to the proper grade and rolled to a reasonably smooth surface. The surface of the subgrade at any point will not vary more than five hundredths of a foot (0.05’) above or one tenth of a foot (0.10’) below the grading plane at any point. Material to be used for backfill shall be as specified on the Drawings. After satisfactory grading and compaction of all backfills in areas to be paved, subgrade soils shall be moisture conditioned to achieve optimum moisture content. The upper six inches (6”) of subgrade soils shall then be uniformly compacted to a minimum of ninety-five percent (95%) relative compaction. This operation shall include any reshaping and wetting or drying required to obtain proper compaction. After compaction, and shaping to line, grade, and cross section, the subgrade shall be sprinkled regularly to moisten the surface and to prevent it from drying out and/or cracking prior to the placement of aggregate base. This operation shall include any reshaping and wetting or drying required to obtain proper

compaction. All soft or otherwise unsuitable material shall be removed and replaced with suitable material.

3.08 FINAL SUBGRADE PREPARATION

A. Final subgrade compaction shall be performed just prior to placement of the subgrade base.

1. **Paved Areas**
   The upper twelve inches (12") of the final subgrade for the areas to be paved shall be scarified and uniformly compacted to a minimum of ninety-five percent (95%) relative compaction at the optimum moisture content. Aggregate base shall be placed within 72-hours of the final subgrade soils compaction.

2. **Pump Station Site**
   The upper six inches (6") of the final subgrade for the pump station shall be scarified and uniformly compacted to a minimum of ninety-percent (90%) relative compaction at the optimum moisture content.

   Clay subgrade soil under the pump station building pad shall have a moisture content of at least the percentage above optimum, immediately prior to placing the Capillary Barrier Material. The required moisture conditioning will be dependent on the final expansion potential of the soils, which will be determined during grading. If the moisture content of the clay soils beneath the slab does not meet the requirements listed in the Geotechnical Report, then over excavation of the soils beneath the pump station building may be required.

3.09 PLACEMENT OF AGGREGATE BASE

A. Final subgrade compaction shall be performed just prior to placement of the subgrade base.

B. Placing of aggregate base shall comply with CALTRANS Standard Specifications Section 26 and in conformity with the lines, grades, and dimensions shown on the Drawings. Aggregate base shall be brought to the optimum moisture content and compacted to a minimum of ninety-five percent (95%) in accordance with ASTM D1557 and California Standard Test Method No. 231. Where the required final thickness is six inches (6") or less, the aggregate base may be spread and compacted in one layer. Where the required final thickness is more than six inches (6"), the aggregate base shall be spread and compacted in lifts not to exceed six inches (6") of thickness. Place sufficient aggregate base on the subgrade to obtain the specified thickness shown after compaction. The surface of the finished aggregate base at any point shall not vary more than five hundredths of a foot (0.05') above or below the grade established by the Engineer.

3.10 REMOVAL AND REPLACEMENT OF TOPSOIL

A. Where excavation crosses lawns, garden areas, pasture lands, cultivated fields, orchards, or

other areas on which reasonable topsoil conditions exist, remove the topsoil for a minimum depth of fifteen inches (15”) for the full width of the excavation. Stockpile this topsoil to one side of the right-of-way and do not mix with the remaining excavated material. Replace the topsoil in the top twelve inches (12”) in the backfilled excavation. In lieu of stockpiling and replacing the topsoil, imported topsoil may be substituted in the top twelve inches (12”) at no additional cost to the City.

B. Maintain the finished grade of the topsoil level with the area adjacent to the excavation or mounded until final acceptance by the Engineer. Repair damage to adjacent topsoil caused by work operations. Remove all rock, gravel, clay, and any other foreign materials from the surface, re-grade, and add topsoil as required.

3.11 SHORING, SHEETING, AND BRACING

A. Except where banks are cut back on a stable slope if approved and as directed by the Engineer, excavations for structures and trenches shall be supported as necessary to prevent caving or sliding.

B. Sheet and brace the excavation when necessary for safety to prevent caving during excavation in unstable material, or to protect adjacent structures, property, workers, and the public. Increase trench widths accordingly by the thickness of the sheeting, shoring, or trench box. Maintain shoring in place until the pipe has been placed and backfilled at the pipe zone. The trench box shall be raised as the backfilling is done in a manner that will not damage the pipe or permit voids in the backfill. Shoring or sheeting shall be removed after placing the pipe zone.

C. All sheeting, shoring, and bracing of trenches and other excavations shall conform to the safety requirements of the Federal, State, or local public agency having jurisdiction. The most stringent of these requirements shall apply.

3.12 DRAINAGE DITCH, PIPELINES, AND CULVERT RESTORATION

A. Except where banks are cut back on a stable slope if approved and as directed by the Engineer, excavations for structures and trenches shall be supported as necessary to prevent caving or sliding.

B. Roadside drainage ditches and all other ditches shall be graded to drain and prevent ponding. Cross-sections and location of ditches shall be as shown in the Drawings. The Contractor shall repair drainage ditches damaged either directly or indirectly by his operations. Drainage ditches shall be compacted to ninety percent (90%) relative compaction. No ponding of surface water near foundations shall be allowed. The Contractor shall correct any drainage ditch breaches occurring as a result of his operations at no cost to the City.

C. Replace in kind drainage pipelines and culverts, which are removed or damaged. Replace pipelines and culverts to the existing lines and grades. Do not replace pipelines and culverts

until the work in the immediate area has been completed, unless otherwise directed by the Engineer. At the inlet and outlet of all culverts the ditch shall be sloped and graded to drain without ponding.

PART 4 – MEASUREMENT AND PAYMENT

All work as specified herein, satisfactorily completed, shall be paid for on a Lump Sum basis as stated in **Bid Item Schedule** for the item listed below:

Bid Item No. 7 – EARTHWORK

-END OF SECTION-

SECTION 02320 - TRENCH EXCAVATION AND BACKFILL

PART 1 - GENERAL

1.01 SCOPE

A. This section covers the work necessary for the trench excavation, structural backfill, trench backfill, installation of locating wire and warning tape and all incidental work, complete.

B. The Contractor shall ensure safety in the trenches, conform to all applicable OSHA requirements and provide all sheeting, shoring, or bracing as required. All materials, labor and workmanship associated with the installation of the piping shall conform to the applicable AWWA, ASTM and County standards.

1.02 RELATED WORK

A. SECTION 02200 – DEMOLITION, CLEARING, GRUBBING, AND STRIPPING

B. SECTION 02300 – EARTHWORK

1.03 SUBMITTALS

A. The Contractor shall provide Certifications that all materials to be used on the project meet the requirements of the standards referenced.

B. Samples and a list of the source of the samples of all imported materials to be used shall be submitted two (2) weeks in advance of use. Samples shall consist of one-half cubic feet (0.5 ft^3) of each type of material.

1.04 GEOTECHNICAL REPORT

A. A Geotechnical Engineering Report: Morgan Hill Well Projects, January 22, 2016 has been prepared for this site by Wallace Kuhl & Associates, West Sacramento, (916) 372-1434. A copy is located in Appendix A. The Contractor is responsible for any conclusions the Contractor draws from the report; should the Contractor prefer not to assume such risk, the Contractor shall employ his own experts to analyze available information or undertake additional subsurface exploration, at no cost to the City. The Contractor shall notify the Engineer and receive the Engineers' approval for any subsurface exploration a minimum of one week prior to beginning any such work. In addition, the Contractor shall notify USA a minimum of 48-hours prior to beginning any subsurface explorations. If there is any discrepancy between the Contractor's experts and the City's Geotechnical representative, the Contractor shall promptly notify the Engineer, prior to beginning any work.

B. In resolving conflicts resulting from errors or discrepancies between this specification and the Geotechnical Report, the Geotechnical Report shall govern over this specification.

PART 2 - MATERIALS

2.01 COARSE GRADE SAND

A. Sand shall be clean, non-plastic, and free from deleterious or foreign matter and shall meet the requirements of Section 90 of the Caltrans Standard Specifications and following gradation requirements:

Sieve Size	Percent Passing
No. 4	90%-100%
No. 200	0%-5%

B. Beach, pit-run, or crusher-run sand shall generally be acceptable.

2.02 FINE GRADE BEDDING SAND

A. Fine grade bedding sand shall be #2 sand that is clean, non-plastic, and free from deleterious or foreign matter, and shall be natural sand or manufactured sand from crushed rock. Use of limestone screenings or stone dust is not permitted. The chloride content of the sand shall be less than 100 ppm and the sulfate content shall be less than 200 ppm. The sand shall be in conformance with ASTM C33, as follows:

Sieve Size	Percent Passing
No. 4	95%-100%
No. 8	85%-100%
No. 16	50%-85%
No. 30	25%-60%
No. 50	0%-30%
No. 100	2%-10%

2.03 PIPE BEDDING AND PIPE ZONE MATERIAL

A. Pipe bedding and pipe zone material shall be sand, fine grade, or coarse grade depending on the type of pipe. Schedule 40 PVC pipe and conduit shall have coarse grade sand bedding and fine grade sand pipe zone material. C900, C905, C909 PVC, polyethylene wrapped ductile iron, and wrapped steel pipe smaller than 3-inches in diameter shall have fine grade sand bedding and pipe zone material. Cement mortar coated pipe, bituminous-coated pipe, CMP, RCP, and unwrapped steel pipe may have either fine or coarse grade pipe bedding and zone material.

2.04 CONTROL DENSITY FILL

A. Refer to SECTION 03300 – CONCRETE for control density fill requirements.

PART 3 - EXECUTION

3.01 TRENCH EXCAVATION

A. Trench excavation is unclassified which includes all excavation, regardless of type, nature or condition of materials encountered. The contractor shall assume full responsibility to estimate the kind and extent of various materials to be encountered in order to accomplish work.

3.02 PIPE BEDDING MATERIAL

A. Place pipe bedding material under the pipe for the full width of the trench in maximum 6-inch lifts. Minimum depth of bedding below the pipe barrel shall be as shown on the Drawings. Excavate bell holes at each joint to permit proper bedding and assembly.

B. Grade the pipe bedding material, by hand if necessary, to the line and grade to which the pipe is to be laid. The pipe bedding material shall form a continuous and uniform bearing and support for the pipe at every point between bell holes, except that the grade may be disturbed for the removal of lifting tackle. If during pipe installation it is found that a pipe section will be at an incorrect grade, that piece shall be removed and the pipe bedding material re-graded to the proper elevation. Compact pipe bedding material to 90-percent relative compaction, in accordance with ASTM D1557.

3.03 PIPE ZONE MATERIAL

A. Place pipe zone material in even lifts on each side of the pipe. Limit compacted lift thickness to 6-inches or the depth of penetration of the compaction equipment used, whichever is less. and compact with mechanical tampers, rollers, or surface vibrators to at least 90-percent relative compaction and in accordance with ASTM D1557. Operate this equipment to prevent damage to the pipe linings and coatings. The pipe shall not be warped by the compaction procedures. Precautions shall be taken to prevent shifting or flotation of the pipe.

3.04 STRUCTURAL BACKFILL

A. Structural fill shall be constructed to the lines and grades as shown in the Drawings, and shall conform to Section 19-3 of the CALTRANS Standard Specifications and these provisions.

1. **Backfill**
   Structural backfill is defined as backfill within five feet (5’) of the face of structures. Excavated areas outside of the five-foot limit shall be backfilled as area fill. Trench backfill within fifteen feet (15’) of structures located in roadways and cultivated areas shall also be defined as structural backfill.

2. **Preparations for Placing Backfill**
   Backfill around concrete structures only after the concrete has cured for at least 3-days. Remove all form materials and trash from the excavation before placing any backfill. Obtain the Engineer's approval of concrete work and attained strength prior to backfilling.

   Do not operate earth-moving or compaction equipment weighing over 1,200-pounds within five feet (5') of walls of concrete structures for the purpose of depositing or compacting backfill material, except as approved. Compact backfill adjacent to concrete walls with hand-operated tampers or other approved equipment that will not damage the structure.

3.05 TRENCH BACKFILL IN IMPROVED AREAS

A. The upper layer of trench backfill material that will be the subgrade for paved, graveled, or other traveled surfaces shall be Class 2 aggregate base and shall be compacted to at least 95-percent relative compaction. Depth of subgrade shall be as shown on the Drawings.

3.06 TRENCHES BELOW SLABS OR STRUCTURAL SECTIONS

A. Where trenches are located below slabs or structural sections of imported material, the pipe zone material shall continue to the subgrade of the lowest layer of imported structural material beneath the slab or structural section, plus longitudinally three feet before and beyond said slab or structural sections.

3.07 MOISTURE CONTROL

A. Maintain backfill at optimum practical moisture content required for compaction. Add water or dry as required prior to placing material in trench. Supplement, if required, by sprinkling. Do not place excessively dry or wet material in trench and then attempt to compact it or modify its moisture content in place.

PART 4 – MEASUREMENT AND PAYMENT

No separate payment will be made for Trench Excavation and Backfill. Payment for work in this section shall be included as part of the applicable Lump Sum or Unit Prices stated in other sections.

-END OF SECTION-

SECTION 02740 - PAVING

Bid Item No. 8

PART 1 - GENERAL

1.01 SCOPE

A. This section covers all work necessary for furnishing and mixing aggregate and asphalt binder at a central mixing plant, excavating, placing, spreading, grading, and compacting the subgrade and structural imported materials including base, asphalt concrete, seal coats, slurry seals, micro-surfacing, and fog seals for asphalt concrete aprons and roadways, complete. See SECTION 02300 - EARTHWORK for additional requirements.

1.02 SUBMITTALS

A. The Contractor shall submit asphalt concrete design mix and data, in accordance with SECTION 01330 – PROJECT RECORDS AND SUBMITTALS. The Contractor shall submit materials testing reports for the asphalt concrete, tack coat, fog seal, slurry seal, and header boards to be used, as well as other pertinent information, certifying that the asphalt concrete pavement meets the requirements of the referenced standards and manufacturer's installation instructions. Contractor shall submit copies of a report from a testing laboratory verifying that the aggregate material conforms to the specified gradations and characteristics as defined herein.

PART 2 - MATERIALS

2.01 GENERAL

A. Hot mix asphalt shall be ½" Type B HMA per Section 39 of the CALTRANS Standard Specifications.

B. Use of reclaimed or recycled material (RAP) is not permitted.

2.02 AGGREGATE SUBBASE

A. Aggregate subbase shall conform to Section 25 of the CALTRANS Standard Specifications except as modified herein. The aggregate subbase shall Class 2 (R-value 50 minimum). No waiver of R-value will be allowed. The aggregate subbase shall be untreated material.

2.03 AGGREGATE BASE

A. Aggregate base shall conform to Section 26 of the CALTRANS Standard Specifications except as modified herein. The aggregate base shall be three-quarters of an inch (3/4") maximum and Class 2 (R-value 78 minimum). No waiver of R-value will be allowed. The aggregate base shall

be untreated material.

2.04 ASPHALT CONCRETE AGGREGATE

A. Asphalt concrete aggregate shall conform to Section 39 of the CALTRANS Standard Specifications and shall be Type B, ½-inch maximum, medium. Aggregates shall be clean and free from decomposed materials, organic material, and other deleterious substances.

2.05 ASPHALT BINDER

A. The asphalt binder to be mixed with aggregate shall conform to the requirements of Section 92 of the CALTRANS Standard Specifications. Asphalt shall be performance graded (PG) 64-10.

2.06 FOG COAT

A. Asphaltic emulsion used for fog coats shall conform to the provisions in Section 94 of the CALTRANS Standard Specifications.

2.07 PAVEMENT MARKING PAINT

A. Pavement marking paint shall conform to Section 84 of the CALTRANS Standard Specifications, specifically formulated for use on asphalt concrete pavement and shall have a proven record of performance and durability.

PART 3 - EXECUTION

3.01 ASPHALT CONCRETE REMOVAL

A. Removal of existing asphalt concrete shall conform to Section 39-3 of the CALTRANS Standard Specifications and the specifications contained herein.

B. All existing asphalt concrete pavement shall be jack-hammered and sawcut where required for installation of new roadway or underground utilities. Contractor shall sawcut along seams where new pavement is to be placed. Cuts shall be straight, clean, and vertical for the full depth of cut. Longitudinal cuts may be wheel-cut with the approval of the Engineer, but shall be discontinued if excessive breakage or deflection of the adjacent pavement to remain occurs. Additional areas shall be cut out when, in the opinion of the Engineer, the edge of the remaining pavement is loose, depressed, or unstable.

C. The asphalt concrete material removed shall become the property of Contractor and shall be disposed of in accordance with the CALTRANS Standard Specifications, Section 7-1.13 at no additional cost to the City.

3.02 AGGREGATE SUBBASE

A. The subgrade shall be prepared in accordance with Section 25 of the CALTRANS Standard Specifications as applicable for roadways and embankments.

B. The aggregate subbase may be spread using motor graders if segregation of large or fine particles of aggregate is avoided and the material as spread is free from pockets of large or fine material. Segregated materials shall be remixed until uniform. Aggregate subbase shall have a relative compaction of not less than ninety-five percent (95%) as determined by ASTM D1557 or Test Method No. California 216.

3.03 AGGREGATE BASE

A. Aggregate base shall be placed and compacted on the prepared subbase in accordance with Section 26 of the CALTRANS Standard Specifications and in conformity with the lines, grades, and dimensions shown in the Drawings.

B. The aggregate base may be spread using motor graders if segregation of large or fine particles of aggregate is avoided and the material as spread is free from pockets of large or fine materials. Aggregate base shall have a relative compaction of not less than ninety-five percent (95%) as determined by ASTM D1557 or Test Method No. California 216.

C. The Contractor shall be responsible for protecting the aggregate base after it has been placed and compacted. The Contractor will not be allowed any additional compensation for the recompaction or retesting of the aggregate base due to the Contractor's failure to place the successive asphalt concrete pavement or other materials within a reasonable time period as determined by the Engineer. The Contractor shall pay for all costs to retest the aggregate base, at no cost to the City.

D. Where the required thickness is eight inches (8") or less, the aggregate base may be spread and compacted in one layer. Where the required thickness is more than eight inches (8"), the aggregate base shall be spread and compacted in lifts not to exceed six inches (6").

3.04 ASPHALT CONCRETE PAVEMENT

A. Workmanship in producing, hauling, placing, compacting, and finishing of asphalt concrete on aggregate base shall conform to Section 39 of the CALTRANS Standard Specifications except as modified and supplemented herein. Unless otherwise shown on the Drawings, an eight-inch (8") compacted layer of aggregate base shall be installed in accordance with CALTRANS Section 26 with a three-inch (3") layer of asphalt concrete in accordance with CALTRANS Section 39.

B. Asphalt concrete shall be produced in a batch mixing plant, a continuous pugmill mixing plant or a drier drum mixing plant. Proportioning shall be either by hot-feed control or cold-feed control.

C. The asphalt concrete shall be placed in maximum two-inch (2") deep lifts and spread and

compacted by methods approved by the Engineer that will ensure a satisfactory end product. Dikes shall be shaped and compacted with an extrusion machine.

D. The Contractor is required to provide adequate protection of the subgrade, aggregate subbase, aggregate base and other materials if the asphalt concrete pavement is not placed within a specified time as determined by the Engineer. Retesting of the subgrade, aggregate subbase, aggregate base or other material will be required and will be paid for by the Contractor, if the asphalt concrete pavement is not placed within a specified time as determined by the Engineer.

3.05 FOG SEAL

A. All new pavement shall be sealed in accordance with Section 37-2.02 of the CALTRANS Standard Specifications.

B. The minimum surface and air temperature required to apply the fog seal shall be 40-degrees Fahrenheit. The Contractor shall remove all surface debris including any dirt or loose pavement, prior to placing the fog seal.

C. The pavement surface shall have cured for no less than 2-months prior to placing fog seal. The minimum application rate for the original undiluted emulsion shall be 0.06-gallons per square yard.

3.06 CONSTRUCTION JOINTS

A. Construction joints shall be made in such a manner as to ensure a neat junction, thorough compaction, and sufficient bonding.

B. A transverse joint extending over the full width of the strip being laid at right angles to its centerline shall be constructed at the end of each day's work and at any other times when the operations of placing the mixture are suspended for a period of time which will permit the mixture to chill. The forward end of a freshly laid strip shall be thoroughly compacted by rolling before the mixture has become chilled. When work is resumed, the end shall be cut vertically for the full depth of the layer.

3.07 PROTECTION OF STRUCTURES

A. Provide all coverings necessary to protect the exposed portions of bridges, culverts, curbs, gutters, posts, guard fences, road signs, plantings, trees, and any other structures from splashing oil and asphalt, dirt, or any other undesirable matter than may come upon these structures by reason of the paving operations.

B. Where water valve boxes, manholes, catch basins, or other underground utility appurtenances are within the area to be surfaced, the resurfacing shall be level with the top of the existing finished elevation of these facilities. If it is evident that these facilities are not in accordance with the

proposed finished surface, notify the Engineer to have the proper authority contacted in order to have the facility altered before proceeding with the resurfacing around the obstruction, unless otherwise approved. Consider any delays experienced from such obstructions as incidental to the paving operation. No additional payment will be made. Protect all covers during asphalt application. After completion of the paving operation, all areas are to be cleaned of excess spilled asphalt materials to the satisfaction of the Engineer.

3.08 WEATHER CONDITIONS

A. Asphalt shall not be applied to a wet material. Asphalt shall not be applied during rainfall, sand or dust storms, or any imminent storms that might adversely affect the construction. Asphalt concrete shall not be placed in the following conditions:

1. When the atmospheric temperature is lower than 50-degrees F

2. During heavy rainfall

3. When the surface upon which it is to be placed is frozen or wet.

3.09 TESTING

A. Thickness Variation

The tolerance of the finished asphalt grade shall be plus or minus 0.01-feet from the required elevation. The finish grade of the new paving shall match the existing pavement and shall conform to the existing cross slope or crown. Variances of more than one-quarter inch (¼") from the edge of existing pavement to new pavement shall not be acceptable.

B. Smoothness Variation

No pockets or depressions, which may cause water to pool, shall be permitted. The surface smoothness of the pavement shall be such that when a twelve-foot (12') straightedge is laid across the pavement, the surface shall not deviate from the straightedge more than one-quarter inch (¼").

3.10 EXCESS MATERIALS

A. The asphaltic concrete material removed shall become the property of the Contractor and shall be disposed off-site in accordance with all applicable State and Local ordinances and CALTRANS Standard Specifications, Section 14.

PART 4 – MEASUREMENT AND PAYMENT

All work as specified herein, satisfactorily completed, shall be paid for on a Lump Sum basis as stated in **Bid Item Schedule** for the item listed below:

Bid Item No. 8 – PAVING

-END OF SECTION-

SECTION 02750 – INTERLOCKING PAVING STONES

Bid Item No. 9

PART 1 – GENERAL

1.01 SCOPE

A. The work shall consist of furnishing and installing interlocking paving stones as shown on the plans and detailed in these specifications.

1.02 RELATED WORK

A. SECTION 02300 – EARTHWORK

1.03 SUBMITTALS

A. Submit product cut sheet and product literature in accordance with SECTION 01330 – PROJECT RECORDS AND SUBMITTALS.

B. Submit unit paver samples to indicate size, shape, and color(s) as specified or as shown on the Drawings.

1.04 PRODUCT SHIPPING AND HANDLING

A. Paving stones shall be delivered and unloaded at the project site on pallets and banded using a combination of galvanized steel and nylon in such a manner that no damage occurs during shipping, off-loading, or handling at the project site.

B. Sand shall be delivered to the job site and stored in such a way as to deter contamination.

1.05 QUALITY ASSURANCE

A. The production of interlocking concrete paving stones shall be by a manufacturer that is a member of the ICPI and SF Concrete Technology, Inc. The manufacturer must possess a minimum of (5) five years experience in the fabrication of concrete paving stones.

B. Installation of interlocking paving stones shall be by a pre-qualified specialty contractor who has been certified by Basalite and/or the ICPI. The specialty contractor shall possess a minimum of (5) five years experience in the interlocking paving stone industry and must have satisfactorily completed projects of similar size and cost.

PART 2 – MATERIALS

2.01 PRODUCT INFORMATION

A. Interlocking Paving Stones shall be in accordance with the drawings, patterns, and details as shown on the plans and/or contained within these specifications. A single source manufacturer in accordance with ICPI standards and guidelines shall produce all paving stones. The Interlocking Paving Stone manufacturer shall be:

Calstone Interlocking Paving Stones
13755 Llagas Avenue
San Martin, CA 95046
408-686-9627 Facsimile 408-686-9127
or Equal

2.02 MANUFACTURING AND EFFLORESCENCE CONTROL

A. Method of manufacturing paving stones to be single-layer production to ensure dimensional uniformity, optimum color blending and product strength and durability. Colors are to be integral throughout unit paver or face-mixed concurrent to project conditions. Multi-layer paver machines and/or block production machines are not acceptable and shall be cause for rejection.

B. Efflorescence shall be minimized with the utilization of a water purification system. The water purification system shall have a minimum water capacity of 160 gallons per minute during paving stone batching cycle. Minimum capacity of (3) three admixture controls to reduce efflorescence and improve quality and texture.

2.03 INTERLOCKING PAVING STONES

A. Interlocking Paving Stones shall match the shape, size, and pattern of the surrounding subdivision sidewalk and conform to the following specifications:

1. Paver shape to be: 12”x12” and 6”x 6” stones
2. Paver Color to be: Tan/red/charcoal #C125
3. Laying Pattern: Linen

Note: Unit pavers from sources other than the specified manufacture must meet or exceed the specified manufacturer’s color loading. Color loading: Color content to be certified by and independent testing facility. Color pigments shall conform to ASTM C979. Paving stone substitute samples, no manufactured by the specified source supplier must be approved in writing by the Project Engineer, and/or the Owner at least (5) five working days prior to bid or the paving stones substitutions will not be accepted.

B. Paver length and width shall not vary by more than + 1/16” (1.6mm) in unit dimension. Paver height shall not vary by more than + 1/8” (3.2mm) from specified standard dimensions.

C. Pavers to have an average minimum compressive strength of 8,000 psi with no paver testing lower than 7,200 psi in accordance with testing procedures ASTM C936, Standard

Specification for Interlocking Concrete Paving Units.

D. Average absorption of 5% with no units greater than 7% when tested in accordance with ASTM C140 and resistance to 50 freeze-thaw cycles in accordance with ASTM C67.

E. Materials used to manufacture concrete paving stones shall conform to the following:

1. Cement: ASTM C150 (Portland Cement)
2. Aggregate: ASTM C33 (screened, washed sand and rock, with no expanded shale or lightweight aggregates).
3. Sand Bedding: Bedding sand shall be washed concrete sand conforming to CALTRANS Department of Transportation Specification Section 90-3.03 fine Aggregated Grading and the following gradation:

Sieve Size	No. 4	No. 8	No. 100	No. 200
% Passing	93 – 100	61 – 100	1 – 12	1 – 7

2.04 GEOTEXTILE FILTER FABRIC

A. Filter fabric shall be a nonwoven material consisting of polyester, nylon, polypropylene filaments formed into a stable network. The fabric shall be permeable, not act as a wicking agent, be inert to commonly encountered chemicals, be rotproof, and resistant to ultraviolet light. The filter fabric shall be Mirafi 500 or equal.

PART 3 – EXECUTION

3.01 GENERAL

A. Do not begin installation of pavers until sub-base has been installed per Specifications. Unit pavers shall be clean and free of foreign materials before installation. Paving work shall maintain proper elevations and slope design. Unit paver surface shall be even, true to line and grade and shall properly coincide and align with adjacent work to elevations. All perimeter edges must be retained to secure the unit pavers and sand-bedding course.

3.02 CUTTING

A. Cutting of unit pavers shall be done with a double bladed stonecutter or diamond blade masonry saw.

3.03 SAND BEDDING COURSE

A. Screed sand bedding course to recommended depth. Sand is to remain undisturbed prior to the installation of unit pavers. Moisture content of sand should remain constant.

B. The thickness of the sand-bedding course should be uniform to ensure an even surface after

compaction of unit pavers. The maximum designed depth should be (1”) one inch thick with no sand thickness less than (3/4”) three-quarters of an inch.

C. The installation of the sand-bedding course will be the responsibility of the paving stone contractor.

D. The finished sub-base should be installed to within + (1/2”) one-half inch of the unit paver thickness plus the (1”) one inch sand-bedding course from final elevation.

3.04 LAYING & INSTALLATION

A. Installation of unit pavers shall start from a corner or straight edge, unless detailed otherwise, and proceed forward over the undisturbed sand-bedding course. Unit pavers shall be installed tight and level on the sand bedding course. String lines shall be used to hold pattern directions true. No unit paver joint shall be greater than (¼”) one-quarter of an inch. No perimeter edge joint should be greater than (3/8”) three-eighths of an inch.

B. A plate vibratory compactor shall be used to compact the unit pavers into the sand-bedding course. A minimum of two passes are required to ensure an even elevation.

C. Dry, angular/fine sand (mortar sand) shall be spread over the compacted unit pavers. Sweep sand into the paver joints while making several passes with the plate compactor. Ensure all joints are full before clean-up. Excess sand shall be swept up and removed from the completed unit paver installation. The completed paving stone installation shall be swept and washed down to provide a clean, finished workman-like landscape surface.

PART 4 – MEASUREMENT AND PAYMENT

All work as specified herein, satisfactorily completed, shall be paid for on a Lump Sum basis as stated in **Bid Item Schedule** for the item listed below:

Bid Item No. 9 – INTERLOCKING PAVING STONES

-END OF SECTION-

SECTION 02820 - CHAIN LINK FENCING

Bid Item No. 10

PART 1 - GENERAL

1.01 SCOPE

A. This section covers the work necessary to furnish and install polymer coated, galvanized chain link fencing, gates, and appurtenances.

1.02 SUBMITTALS

A. Contractor shall make the following submittals to the Engineer.

1. One square foot sample of chain link fabric, and shop drawings showing gauge, dimensions, and coating information.

2. Shop drawings showing standard pipe section, wall thickness, coating, and other pertinent information for line posts and end posts.

3. One-foot length of plastic privacy fence slat.

4. Submit available polymer coating color samples conforming to ASTM F934 for City's selection.

5. Wind load force analysis and calculations shall be submitted to verify post size and post spacing

1.03 TEMPORARY FENCING

A. Refer to SECTION 01565 – TEMPORARY BARRIER FENCING.

PART 2 - MATERIALS

2.01 GENERAL

A. To ensure system integrity, the chain link system, framework, fabric, fittings, gates and accessories must be obtained from a single source.

2.02 CHAIN LINK FABRIC

A. Chain link fence fabric shall be two inch (2") diamond mesh size with 9 gauge wire.

B. Chain link fence fabric shall be made of steel wire helically wound and interwoven in such a manner as to provide a continuous mesh without knots or ties except in the form of knuckling or twisting the ends of the wire to form the desired selvage of the fabric. Chain link fabric shall be knuckled along the bottom. Wire strengths shall conform to ASTM A817.

C. Fencing fabric shall be 7 (+/- ¾") feet high unless otherwise shown.

D. Chain link fence fabric shall be polymer coated over galvanized steel wire per ASTM F668 and shall have a Class 2a – Extruded and Adhered (Bonded) coating.

2.03 STEEL PIPE

A. Steel pipe used for posts, rails and braces shall have a minimum steel yield strength of 30,000 psi conform to ASTM F1043 Group IA, regular strength grade ASTM F1083, schedule 40 hot-dip galvanized pipe having a 1.2 oz. a square foot on the outside and inside surface.

B. Line posts shall be 2-3/8 inch outside diameter with wall thickness of 0.154 inches, weighing 3.65 pounds per foot.

C. Corner and end posts shall be 5-9/16 inch outside diameter with wall thickness of 0.258 inches, weighing 14.63 pounds per foot.

D. Braces and top and bottom and mid rails shall be 1-5/8 inch outside diameter with wall thickness of 0.140 inches, weighing 2.27 pounds per foot.

2.04 GATES, FRAMES AND POSTS

A. Gate frames shall be 2-3/8 inch outside diameter with wall thickness of 0.154 inches, weighing 3.65 pounds per foot. Gate frames shall be provided with a 4 inch by 4 inch opening in fabric for locking chain.

B. Gate posts shall be 4 inch outside diameter with wall thickness of 0.226 inches, weighing 9.12 pounds per foot. Each swing gate leaf shall be provided with a two diagonal braces. Gate post braces shall be 1-5/8 inch outside diameter with wall thickness of 0.140 inches, weighing 2.27 pounds per foot.

C. Chain link swing gates shall be constructed/installed as per ASTM F900.

D. Chain link cantilever slide gates shall be constructed/installed as per ASTM F1184.

2.05 MISCELLANEOUS FITTINGS

A. All chain link fence etc. described below shall conform to ASTM F626 as applicable.

1. Post caps shall be made of steel, cast iron or aluminum alloy and must be weatherproof to prevent moisture intrusion into post. Top with arm to be provided when barbed wire is specified. Intermediate or line post tops to have loop for top rail when specified.

2. Gate hinges, drop bar locking devices, caps, gate stops and miscellaneous nuts, bolts, screws, bands, and other appurtenances shall be consistent in quality and strength to the rest of the fence.

3. Fittings used shall be hot-dip galvanized iron or steel in accordance with ASTM A123 or A153, whichever is applicable.

4. Top and/or bottom and or mid rail ends shall be formed steel or iron, designed to provide secure connection of top rails to terminal post and brace or other rails to terminal and intermediate posts.

5. Fabric ties shall be 9 gauge for attachment of chain link fabric to rails. Wire clips shall be minimum 6 gauge, hot dip galvanized. Steel bands shall be minimum 11 gauge, one-inch wide, hot dip galvanized.

6. Fabric bands and brace bands to be pressed steel.

7. Tension (stretcher) bars to be made of one continuous piece of steel or aluminum, 3/16” x 3/4”, in the same height as the fence. Provide one bar, per end or gate post and two bars per corner or pull post.

8. Truss rods shall be fabricated of 3/8-inch diameter steel rods and shall have turnbuckles or similar means of adjustment.

9. All nuts and bolts shall be 3/8” diameter, hot dip galvanized before color coating.

2.06 POLYMER COATINGS

A. The exterior of all steel pipe, fabric, fittings, fasteners, rods, and wire shall have a Class 2a polymer coating conforming to ASTM F668 with a minimum and maximum thickness of 38 to 64 mils respectively. Moveable parts, nuts and bolts to be field coated with polymer liquid touch up after installation.

B. All specified wire gauges refer to the core gauge, without coatings.

2.07 FENCE SLATS

A. Fence slats shall be flat tubular in shape, with reinforced “legs” inside for extra durability. Slats shall be extruded from High Density Polyethylene, color pigments and ultra violet (UV)

inhibitors, specifically designed to retard the harmful effects of the sun and lengthen the life of the product. Slats shall be as wide as to maximize coverage area of the chain link fabric with a minimum 75% wind load and privacy factor. Slats shall be Bottom – Lock type as manufactured by Pexco, or equal.

2.08 CONCRETE

A. Concrete for post foundations shall be as specified in SECTION 03300 - CONCRETE.

PART 3 - EXECUTION

3.01 GENERAL

A. Fencing shall be installed in accordance with ASTM F567.

3.02 FENCE

A. Line posts shall be equally spaced between corners, end posts, and gateposts at a spacing not exceeding 10 feet. Posts shall be set vertical, shall be accurately aligned, and shall have their tops level or at a constant slope between changes in grade. Tubular posts shall be fitted with extension arms for barbed wire. Post top shall permit passage of top rail or rainproof malleable iron caps as applicable.

B. All posts shall be centered in concrete foundation and shall be set into the concrete to a minimum depth of 36 inches. Corner, end, and gate posts shall be set in concrete foundations not less than sixteen inches (16”) in diameter, and line posts shall be set in concrete foundations not less than twelve inches (12”) in diameter. The top surface of the concrete foundations shall be at least one inch (1”) above grade, be sloped to drain, and have a neat and uniform appearance.

C. Corner, end, and gateposts shall be braced to the nearest line post. Corner and end posts shall be braced as shown on the Drawings. Bracing for gateposts shall be horizontal braces with truss rods. Line posts shall be braced horizontally and trussed in both directions with truss rods at 10-foot minimum intervals. Top rails, where specified, shall be in lengths not less than 18 feet and shall be fitted with couplings for connecting lengths into continuous runs. Couplings shall be not less than 6 inches long and allow for expansion and contraction of the rail.

D. Chain link fabric shall be taut and shall be attached to posts, rails, and wires with galvanized fabric bands or tie wires at a maximum spacing of 12 inches on posts and 18 inches on the rails or tension wires. Stretcher bars shall be provided at ends of fabric. The top and bottom rail shall be located a minimum of 1 inch and maximum of 2 inches above the finished grade and on a straight grade between posts by excavating the high points of ground, and in no case shall depressions be filled.

3.03 GATES

A. All swing and man gates shall be installed to the manufacturer's specifications. Gate frames shall be fabricated with welded joints or rigid connectors. The fabric shall be the same as that used for the fence and shall be rigidly attached to the frames. Frames shall be suitably braced and trussed. Gates shall be equipped with suitable offset hinges to permit a 180-degree swing and a drop bar locking device with provision for padlocking. A stop to hold the gate open and a center rest with catch shall be provided. City will provide the locks.

PART 4 – MEASUREMENT AND PAYMENT

All work as specified herein, satisfactorily completed, shall be paid for on a Lump Sum basis as stated in **Bid Item Schedule** for the item listed below:

Bid Item No. 10 – CHAIN LINK FENCING

-END OF SECTION-

SECTION 03300 - CONCRETE

Bid Item No. 11

PART 1 - GENERAL

1.01 SCOPE

A. This section covers the work necessary for furnishing and placing of all concrete for construction of the well pump pedestal, slab, utility pads, thrust blocks and other miscellaneous concrete structures including forms, reinforcing steel, cement finishing, fence footings and all other miscellaneous related work, complete. The Contractor shall determine the mix proportions for concrete in conformance with these specifications.

1.02 SUBMITTALS

A. The Contractor shall submit complete data on the concrete mix for approval of all materials used in the mixture, in conformance with ASTM C94, as last amended.

B. The Contractor shall make the following submittals for the Engineers approval:

1. Complete data on each concrete mix including aggregate gradations and admixtures in conformance with ASTM C94.

2. Submit either data compiled by a certified Testing Laboratory from a minimum of thirty (30) previous compression tests or a batch test for each proposed mix design.

3. Curing compound, joint filler, and joint sealant data, including the manufacturer's application instructions.

4. Reinforcing steel shop drawings in accordance with CRSI 1990 Manual of Standard Practice and ACI Standard Practices.

1.03 TESTING

A. The City reserves the right to have test cylinders taken and tested by an approved testing laboratory to verify strength of the concrete. Acceptance and evaluation of the concrete strengths shall be by the City in accordance with ACI 318, current edition.

1.04 STANDARDS

A. All work in this section shall conform to the requirements in the Specifications set forth herein, in the Drawings, with Section 90 of the CALTRANS Standard Specifications, and in accordance with the applicable ACI, ASTM, and CRSI Standards.

PART 2 - MATERIALS

2.01 PORTLAND CEMENT

A. Portland cement shall be Type II-V low alkali. Milling data sheet shall be provided with submittal demonstrating compliance with ASTM C150, as last amended.

2.02 FLY ASH

A. Class F coal fly ash as a raw or calcined natural pozzolan may be used to replace up to twenty-five-percent (25%) by mass of Portland cement in concrete mixtures. Materials data sheet shall be provided with submittal demonstrating compliance with ASTM C618, as last amended.

2.03 SLAG CEMENT

A. Ground granulated blast furnace slag, Grade one-hundred (100) minimum, may be used to replace up to twenty-five percent (25%) by mass of Portland cement in concrete mixtures containing fly ash. If no fly ash is used in the mixture, up to fifty-percent (50%) slag cement, by mass, may be used to replace Portland cement. Milling data sheet shall be provided with submittal demonstrating compliance with ASTM C989, as last amended.

2.04 AGGREGATE

A. Fine aggregates shall be clean, hard, natural and free from all foreign matter. Coarse aggregate shall be sound, crushed rock or gravel, free from adherent coating, organic water or injurious amounts of flat or friable pieces. All aggregates shall be clean and free from deleterious coatings, clay balls, roots, and other extraneous materials.

B. Fine and coarse aggregate shall conform to ASTM C33 or CALTRANS Standard Specifications Section 90-1.02(4)(d), as shown below. The Contractor shall submit to the Engineer for approval, a grading of the combined aggregate proposed for use in the concrete that meets the grading requirements below:

C. Fine and coarse aggregate shall conform to ASTM C33 or CALTRANS Standard Specifications Section 90-3.04, as shown below. The Contractor shall submit to the Engineer for approval, a grading of the combined aggregate proposed for use in the concrete that meets the grading requirements below:

GRADING LIMITS OF COMBINED AGGREGATES

Sieve Sizes	1" Max.
1 ½"	100%
1"	90%-100%
3/4”	55%-100%
3/8”	45%-75%
No. 4	35%-60%
No. 8	27%-45%
No. 16	20%-35%
No. 30	12%-25%
No. 50	5%-15%
No. 100	1%-8%
No. 200	0%-4%

2.05 WATER

A. Water for washing aggregate, mixing, and for curing shall be free from oil and deleterious amounts of acids, alkalis, and organic materials; shall not contain more than 1,000 mg/L of chlorides as Cl, nor more than 1,300 mg/L of sulfates as SO_4; and shall not contain an amount of impurities that may cause a change of more than twenty-five percent (25%) in the setting time of the mix nor a reduction of more than five percent (5%) in the compressive strength of the mix at 14-days when compared with the result obtained with distilled water. Additionally, water used for curing shall not contain an amount of impurities sufficient to discolor the mix.

2.06 CHEMICAL ADMIXTURES

A. To facilitate concrete construction applications, Water-Reducing (Normal, Mid-Range, and High-Range) and Set-Controlling Admixtures such as Type A or F, (water-reducing); Type B, (retarding); or Type D or G, (water-reducing and retarding) admixtures, meeting ASTM C494, as last amended, are permitted for use.

2.07 AIR-ENTRAINING ADMIXTURES

A. Air entraining admixtures shall meet the requirements of ASTM C260 as last amended.

2.08 REINFORCING STEEL

A. Reinforcing bars shall meet the requirements of ASTM A615 as last amended, for structural grade, deformed bars, (except that 1/4" shall be plain rounds). No. 5 bars and smaller shall be minimum Grade 40, No. 6 bars and larger shall be Grade 60. Welded wire fabric shall meet the requirements of ASTM A185. All reinforcements shall be clean and free of paint, loose rust, scale, and shall be securely held in place and tied at all intersections, corners, and splices with

#16-gauge minimum annealed wire. Provide concrete blocks of same strength as the concrete mix to support reinforcing bars. Do not use broken concrete brick or stone.

2.09 FORMS

A. Forms shall be accurately constructed of clean lumber. The surface of forms against which concrete is placed shall be smooth and free from irregularities, dents, sags or holes. Forms shall be a minimum size of one inch (1") thick, or other suitable material spaced with spreaders, and tied together, all subject to the Engineer's approval. Removal of forms shall be as directed with all debris removed, in, under, or around the structures. Forms shall be mortar-tight, true to the dimensions, lines and grades of the structure, and of sufficient strength to prevent dislocation of the formwork during the placement of the concrete. Forms shall follow the recommendations of ACI 347, unless otherwise specified.

2.10 FORM TIES

A. Form ties on exposed surfaces shall be located in a uniform pattern or as indicated on the Drawings. Form ties shall be constructed so that the tie remains embedded in the wall, except for a removable portion at each end. Form ties shall have conical or spherical type inserts, inserts shall be fixed so that they remain in contact with forming material, and shall be constructed so that no metal is within 1 inch of the concrete surface when the forms, inserts, and tie ends are removed. Wire ties will not be permitted. Ties shall withstand all pressures and limit deflection of forms to acceptable limits.

2.11 BITUMINOUS TYPE PREMOLDED JOINT FILLER

A. Bituminous type pre-molded joint filler shall conform to ASTM D994 or D1751, as last amended, unless otherwise shown or specified on the Drawings.

2.12 JOINT SEALANT

A. Joint sealant shall be a two-component, traffic grade polyurethane, elastomeric sealant, and shall conform to ASTM C920, Type M, Grade NS.

2.13 CURING COMPOUND

A. The curing compound to be used shall be Non-Pigmented-Chlorinated Rubber Base-Clear, as listed in CALTRANS Standard Specifications Section 90-1.03B(3) conforming to ASTM C309, Type 1, Class B, as last amended.

2.14 BONDING COMPOUNDS

A. Bonding compounds shall be recommended by manufacturer as suitable to meet job requirements with regard to surface, pot life, shelf life, set time, vertical or horizontal application, forming

restrictions, etc. Furnish manufacturer's specific instructions for this job application, and obtain Engineer's review prior to purchase.

B. Epoxy resin bonding compounds shall be used for wet areas and shall be Adhesive Engineering, Concresive Nos. 1001, 1001-LPL or 1180 as applicable; Sika Chemical Corporation, Sikadur 35, Hi-Mod LV, Sikadur 32, Hi-Mod, or Sikadur 31, Hi-Mod Gel as applicable; Burke Company 881 LPL Epoxy; or equal.

C. Non-epoxy bonding compounds shall be used for dry areas and shall be Burke Company, Acrylic Bondcrete; Imperial Chemical Industrial, Inc., Thoro System Products, Acryl 60; Thorobond; or equal. Bonding compounds shall be applied in accordance with the manufacturer's instructions.

2.15 VAPOR BARRIER

A. Subgrade preparation of the concrete floor slab shall include applying a 0.004-inch thick polyethylene film vapor barrier over a 4-inch thick ¾-inch maximum clean, crushed rock layer. The barrier shall be covered by 2-inches of moist sand. The polyethylene film shall be Visqueen as manufactured by Visking Co., Fremont, CA, or approved equal, and shall be installed per the manufacturer's instructions.

PART 3 - EXECUTION

3.01 CONCRETE

A. Mixing

Concrete may be ready-mixed or batch mixed at the site. Ready mix concrete shall conform to ASTM C94, as last amended. Concrete shall be placed within 1-1/2-hours after cement has been added to the mix. A delivery ticket shall be furnished to the Engineer with the following information:

1. Name of concrete supplier
2. Serial number of ticket
3. Date
4. Truck number
5. Mix Identification #
6. Amount of concrete
7. Time loaded
8. Water added
9. Time unloaded

On-site batch mixing shall be performed upon written approval of Engineer. After all ingredients are in the mixer, concrete shall be mixed for a minimum of 1-1/2-minutes.

B. Slump

Slump shall be tested to meet the requirements of ASTM C143, as last amended. Slump range shall be 4 ± 1-inches for ring wall, pump stations, slabs, utility pads, pipe embedment, pipe and fence encasements, and thrust blocks. Slump range shall be 9 ± 1-inches for control density fill applications such as trench backfill, pipe bedding, or pipe filling for abandonment in place.

C. Compressive Strengths

1. Structural Concrete

Unless otherwise specified on the Drawings, the minimum allowable 28-day compressive strength for structural concrete (used for slabs, foundations, pump pedestal, thrust blocks, ringwalls, duct banks, etc.) shall be 3,000 psi when cured and tested in conformance with ASTM C31 and C39, as last amended.

2. Minor Concrete

Unless otherwise specified on the Drawings, the minimum allowable 28-day compressive strength for minor concrete structures (used for small utilities pads, and other miscellaneous concrete pours) shall be 2,500 psi when cured and tested in conformance with ASTM C31 and C39, as last amended.

3. Control Density Fill

Unless otherwise specified on the Drawings, the minimum allowable 28-day compressive strength for control density fill concrete shall be 50-150 psi when cured and tested in conformance with ASTM C31 and C39, as last amended.

4. Water/Cementitious Materials Ratio

Cementitious materials include, but are not limited to, Portland cement, Slag Cement, and Fly Ash. The maximum allowable water-cementitious materials ratio (w/cm) for minor and structural concrete mixtures is 0.5 unless otherwise specified on the contract drawings. The maximum allowable w/cm for control density fill is not limited unless otherwise specified on the contract drawings. The water content of all admixtures and aggregates shall be taken into account in the determination of the w/cm.

3.02 FORMS

A. Concrete structures shall be constructed as shown on the Drawings. Construct forms accurately to dimensions and elevations required and to be strong and unyielding. Construct forms with tight joints to prevent the escape of mortar and to avoid the formation of fins. Brace as required to prevent distortion and to fully support all loads during concrete placement and curing. The inside surfaces of forms shall be cleaned of all dirt, mortar, and foreign material prior to placing concrete. Forms shall be kept wet before concrete is placed.

3.03 PLACING REINFORCING STEEL

A. Place reinforcing steel, when required, in accordance with the Drawings, ACI 301, and Concrete

Reinforcing Steel Institute's (CRSI) "Recommended Practice for Placing Reinforcing Bars," except as modified herein. The reinforcement shall be so secured in position that it will not be displaced during the placement of concrete. All reinforcing steel, welded wire reinforcement, and tie wire shall be completely encased in concrete. Reinforcing steel shall not be welded unless specifically required by the Drawings or otherwise directed by the Engineer. Bars shall not be straightened or re-bended in a manner that will damage the material; all reinforcing steel shall be cold bent. All reinforcements shall be clean and free of paint, loose rust, and scale.

B. Minimum length of splices shall be as herein specified. Top bars shall be defined as any horizontal bar placed such that twelve inches (12") of fresh concrete is cast below in any single pour. Horizontal wall bars are considered top bars. All top bars shall have 42 diameter lap with minimum of 24-inches. All other bars shall have 30 diameter lap with minimum of 18-inches. Tie splices with #16-gauge minimum annealed wire as specified in the referenced CRSI standard.

3.04 PLACING CONCRETE

A. Prior to placing concrete, remove water from excavation and all debris and foreign material from forms. Check the reinforcing steel, if required, for proper placement and correct any discrepancies. Before depositing new concrete on old concrete, clean surface and pour a cement sand grout to a minimum depth of 1-inch over the surface.

B. Place concrete as soon as possible after leaving mixer, without segregation or loss of ingredients, minimizing splashing on forms or steel above, and in layers not over 2-feet deep. The vertical drop to final placement shall not exceed 6-feet. Placement shall conform to the requirements of ACI 301 and ACI 318, except as modified herein. No concrete shall be placed or used after it has begun to set, and no tempering shall be allowed. Chuting will be permitted only if means are taken to prevent segregation.

C. Do not place concrete when the ambient temperature is below 40-degrees F or approaching 40-degrees F and falling, without special protection as approved by the Engineer. Concrete that has been frozen or damaged by other causes, as determined by the Engineer, shall be removed and replaced by the Contractor at no additional cost to the City. The Contractor shall conform to the requirements of "Hot Weather Concreting" as reported by ACI Committee 305R when placing concrete in hot weather.

D. Under rainy conditions, placing of concrete shall be stopped before the quantity of surface water is sufficient to damage surface mortar or cause a flow or wash of the concrete surface, unless the Contractor provides adequate protection against damage.

E. All concrete shall be vibrated during placement to assure a dense and homogeneous set. Apply concrete vibrator at points spaced not farther apart than vibrator's effective radius. Apply close enough to forms to vibrate surface effectively but not damage form surfaces. Vibrate until concrete becomes uniformly plastic. Vibrator must penetrate the fresh placed concrete and into the previous layer of fresh concrete layer below.

3.05 PLACING CONCRETE PAVEMENT

A. Portland cement concrete pavement shall conform to Section 40 "Portland Cement Concrete Pavement" of the CALTRANS Standard Specifications, ASTM C94, ACI 304R, and these Specifications. The Portland cement concrete shall be constructed in conformance with the requirements of Section 90 "Portland Cement Concrete" of the CALTRANS Standard Specifications. Portland cement concrete pavement shall be constructed to the dimensions, lines and grades shown on the Plans.

B. The Contractor shall make adequate advance arrangements to prevent delay in delivery and placing of concrete. An interval of more than forty-five (45) minutes between placing of any two (2) consecutive batches or loads shall constitute cause for stopping paving operations, and the Contractor shall make a construction joint, in the concrete already placed, at the location and of the type directed by the Engineer. Such construction joint shall be made at the Contractor's expense.

C. Slip-form paving and finishing equipment shall be properly adjusted and in satisfactory operating condition. Prior to placing concrete, the Contractor shall demonstrate proper adjustment of all screeds and floats on slip-form pavers by measurement from grade stakes driven to known elevations. Satisfactory operation and adjustment of all propulsion and control equipment, including pre-erected grade and alignment lines, shall be demonstrated by moving slip-form pavers and finishing machines over a five-hundred-foot (500') length of prepared subgrade with all propulsion and control equipment fully operational.

D. All pavement concrete shall be placed while fresh. The use of water for re-tempering any concrete will not be permitted. The temperature of the concrete mix at the time of placement shall not exceed 90-degrees F. Pavement shall be placed, finished, textured, cured, protected, and repaired in accordance to Section 40 "Portland Cement Concrete Pavement" of the CALTRANS Standard Specifications, except that final texturing with a spring steel tine will not be required and pavements shall be finished by ACI certified finishers and also in compliance with ACI 121R.

3.06 CONSTRUCTION JOINTS

A. Locate as shown or as approved, except that maximum spacing between construction joints shall be 10-feet.

A. The pre-molded joint filler shall be of sufficient width to completely fill the joint space.

3.07 FINISHING

A. Concrete work for the pump station pedestal/slab shall be ball floated with a wood float and finished with a light broom finish. All exposed edges shall be finished with a steel-edging tool.

B. Sidewalks and exterior slabs available to foot traffic shall be ball floated with a wood float, wood troweled, and lightly troweled with a steel trowel, and finished with a coarse broom to obtain a nonskid surface.

C. All other concrete work shall be ball floated with wood float and troweled with steel trowel to a smooth finish free from trowel marks. Do not absorb wet spots with neat cement.

3.08 REMOVAL OF FORMS

A. Remove forms after concrete has set sufficiently to carry the dead load and construction load it has to sustain and when approved by the Engineer. The minimum time or strength allowed before backfilling is allowed against concrete slabs and walls shall be three (3) days or 2,000 psi, unless otherwise approved by the Engineer. Remove forms with care to prevent scarring and damaging the surface.

B. Immediately upon the removal of forms, voids shall be neatly filled with cement mortar, non-shrink grout, or epoxy bonding agent and repair mortar as required for the application and as directed by the Engineer.

3.09 PROTECTION AND CURING

A. Protect fresh concrete from direct rays of the sun, drying winds, and wash by rain, when possible. Cure formed surfaces with an approved curing compound applied in conformance with the manufacturer's directions as soon as the forms are removed and finishing completed.

B. The curing compound shall be uniformly applied immediately after the finishing operation, before the moisture sheen disappears from the surface. The curing compound shall be used within 120-days of manufacture.

3.10 PATCHING

A. Cut out all honeycombed and defective areas. Cut edges perpendicular to surface at least 1-inch-deep, no feather edge allowed, and patch. Using bonding agent, fill holes' flush with cement mortar composed of 1-part cement and 2-parts sand. Rub surface with wood float and burlap. Keep patches damp for a minimum of 7-days or spray with curing compound to minimize shrinking. Fill all form tie holes in same manner. Defective work shall be corrected to the satisfaction of the Engineer.

3.11 CONCRETE BEDDING AND ENCASEMENT

A. Place concrete bedding up to a height of 1/3 of the outside diameter of the pipe in all trenches requiring concrete bedding. Place concrete bedding and encasement in such a manner that no dirt or foreign material becomes mixed with the concrete. Concrete shall be placed as shown on the

Drawings. Concrete shall have sufficient strength before any additional backfill material is placed in the trench.

3.12 EMBEDMENTS

A. Gate frames, fence posts, light fixtures, gate thimbles, special castings, channels or other miscellaneous metal parts that are to be embedded in the concrete shall be set and secured in the forms prior to concrete placement. Unless otherwise specified, anchor bolts and inserts shall be embedded in concrete as shown. The Contractor shall provide inserts, anchors or other bolts necessary for the attachment of piping, valves, metal parts and equipment. Operators or sleeves for gate or valve stems shall be positioned to clear reinforcing steel, conduit and other embedments, and to align accurately with equipment.

3.13 TESTING

A. The City shall have test cylinders taken and tested by an approved testing laboratory to verify strength of the concrete, in conformance with ASTM C31. Acceptance and evaluation of the concrete strengths shall be by the City in accordance with ACI 318.

3.14 FAILURE TO MEET STRENGTH REQUIREMENTS

A. Concrete is expected to reach higher compressive strength than that which is indicated in 3.01. The strength level of concrete will be considered acceptable if following conditions are satisfied per ACI 318:

1. The averages of all sets of 3 consecutive strength test results are greater or equal to the specified compressive strength.

2. No individual strength test (average of 2 cylinders) falls below the specified compressive strength, by more than 500 pounds per square inch.

3. Whenever one, or both, of 2 conditions stated above is not satisfied, the City may request the Contractor to provide additional curing of affected portion followed by cores taken in accordance with ASTM C42, ACI 318, and ACI 350 and comply with the following requirements:

    a. If the additional curing does not bring average of 3 cores taken in affected area to at least specified compressive strength, designate such concrete in affected area as defective.

    b. The Engineer may require the Contractor to strengthen defective concrete by means of additional concrete, additional reinforcement, or replacement of all defective concrete, all at the Contractor's expense.

4. If the above conditions are not satisfied and the concrete fails to meet the minimum 28-day

compressive strength, the under-strength concrete shall be removed and replaced at no additional cost to the City.

PART 4 – MEASUREMENT AND PAYMENT

All work as specified herein, satisfactorily completed, shall be paid for on a Lump Sum basis as stated in **Bid Item Schedule** for the item listed below:

Bid Item No. 11 – CONCRETE

-END OF SECTION-

SECTION 03400 - PRECAST CONCRETE

PART 1 - GENERAL

1.01 SCOPE

A. This section covers the work necessary to furnish and install all precast concrete vaults, boxes, catch basins, manholes and appurtenances, complete.

1.02 GENERAL

A. Precast concrete structures shall be constructed of units of the types, dimensions, arrangements, and coursing indicated on the drawings and specified herein, complete with all materials, accessories, and appurtenances as indicated, specified, or required.

1.03 SUBMITTALS

A. The Contractor shall make the following submittals:

1. Shop drawings for all precast concrete items. Submitted drawings shall show all dimensions, location and type of embedded items, knockouts, lifting inserts, and details of reinforcement and joints.

2. The design criteria used by the manufacturer, for all precast items.

3. Approved ICBO reports for all lifting inserts, showing allowable design loads on the inserts.

4. Verification of compressive strength. Such verification shall be laboratory trial batch test results with a minimum of three test cylinders or a series of production compression tests with a minimum of 20 sets of test data which fall within the acceptance criteria specified herein. Such tests must have been made within the previous 2 years on the identical concrete mix submitted.

PART 2 - MATERIALS

2.01 PRECAST BOXES, VAULTS, AND MANHOLES

A. Size

Boxes, vaults, and manhole dimensions shall be as required on the Drawings.

B. Material

Concrete used for precast boxes, vaults, and manholes shall have a minimum compressive strength of 3,000 psi, unless otherwise shown on Drawings.

C. Covers

Unless otherwise noted on the Drawings, electrical manholes and pull boxes shall have concrete covers with minimum 30-inch diameter galvanized steel lids, which are bolted to galvanized steel frames with stainless steel bolts. Valve and meter boxes shall have cast iron covers. Valve boxes shall have triangular-shaped covers. The frames and lids shall be provided by the box or vault manufacturer. All covers shall have a minimum of two hex head bolts to secure them to the frame. Covers shall have lifting handles. When leveling bolts are used to set the vault top sections, the Contractor shall ensure that the load on the vault will be transferred through the mortar to the vaults and will not be carried by the leveling bolts. All covers shall be marked with cast-in or weld bead lettering to identify the service as shown. All manhole covers which do not fit neatly and bear firmly in the ring will be rejected.

D. Loading

Where boxes, vaults, or manholes are in areas that may be subjected to vehicular traffic, they shall be designed for H-20 traffic loading. In other areas, they shall be designed for a vertical live load of 300 psf. Lateral loads on all boxes, vaults, and manhole walls shall be as follows:

1. Soil Static: 65 x h (psf) triangular equivalent fluid pressure plus surcharge of 240 psf in areas designated for vehicular traffic, where h = depth of fill (feet).

2. Soil Seismic: 29 x h (psf) uniform load distribution, where h = depth of fill (feet).

3. Seismic Acceleration: As determined using the provisions set forth in the CBC Zone 4 requirements but with Z = 0.5, I = 1.25 but not less than 0.28 g acting on structure mass.

2.02 PRECAST STORM DRAIN AND SEWER MANHOLES AND COVERS

A. Precast manhole barrels, risers, cones, and grade rings shall conform to ASTM C478 with the additional requirement that the cement used shall be Type II. Standard concentric cones shall be used on all manholes and manhole sections shall be manufactured without the provision for steps. Manhole bases shall be precast when the internal diameter of the largest pipe is less than thirty three inches (33”). Standard concentric cones conforming to ASTM C478 shall be used. Storm drain manholes and manhole covers shall conform to the County of Santa Clara.

2.03 SITE-CAST ITEMS

A. Site-cast items shall conform to SECTION 03300 - CONCRETE and shall include all reinforcing steel, embeds, and other items necessary for such placement. All portions of embeds which remain embedded in the concrete shall be made of stainless steel.

2.04 NON-SHRINK GROUT

A. Non-shrink grout shall conform to SECTION 03600 – GROUT AND MORTAR.

2.05 RESILIENT CONNECTORS

A. Resilient connectors shall conform to ASTM C923 and shall be a flexible compression gasket, which is set during the precast process or a boot connector, shall be Calpico Pipe Link, Kor-N-Seal, A-lock, or approved equal.

2.06 MORTAR

A. Mortar shall conform to SECTION 03600 – GROUT AND MORTAR.

2.07 EPOXY ADHESIVE

A. Epoxy adhesives shall conform to CALTRANS Standard Specifications Section 95.

2.08 PREFORMED JOINT SEALANT

A. The joint sealing compound shall be Quik-Seal, a preformed, cold-applied, ready to use plastic joint sealing compound as supplied by Quikset Utility Vaults; Ram-Neck by K.T. Snyder Company; or equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Precast items shall be installed in accordance with the manufacturer's recommendations, unless otherwise shown on the Drawings. All joints shall be sealed by the use of preformed sealant so as to be watertight. All precast items shall be set on a minimum foundation of six inches (6") of Class 2 aggregate base and compacted to at least ninety five percent (95%) relative compaction, unless otherwise shown on the Drawings.

B. Connections to manufactured precast items shall be made by casting sections of pipe into the items, using non-shrink grout as shown on the Drawings, and/or using an approved resilient connector. All such connections shall be watertight.

3.02 STORM DRAIN, SEWER, AND OVERFLOW MANHOLES

A. Construction of storm drain, sewer, and overflow manholes shall conform to the American Public Works Standards, detail B20-1 and these Specifications. Pipe connections to precast manhole bases shall be made with a resilient connector. For cast-in-place bases the connection shall be made with a water stop. All connections shall be water and soil tight. The method of placement of mortar to finish the manhole shall conform to CALTRANS Standard Specifications Section 51-1.03.

B. Joints in precast manhole shafts shall be sealed by buttering the joint space of the previously laid

barrel section or base with mortar or shall be sealed with preformed plastic sealing compound and installed as recommended by the manufacturer. All joint surfaces shall be thoroughly cleaned prior to placing the sealing compound or buttering with mortar. The inside and outside of mortared joints shall be plastered with mortar and the inside brushed to a smooth finish with a wet brush. Special precautions shall be taken to see that the entire joint space is filled with mortar, is watertight, and is approved by the Engineer.

C. The joint between the manhole frame and the cone or grade ring shall be sealed by buttering the joint space with mortar or epoxy adhesive.

3.03 TESTING

A. All sanitary sewer, storm drain, and overflow precast manholes and vaults shall be tested in accordance with SECTION 15950 - PERFORMANCE TESTING AND FACILITY STARTUP.

PART 4 – MEASUREMENT AND PAYMENT

No separate payment will be made for Precast Concrete. Payment for work in this section shall be included as part of the applicable Lump Sum or Unit Prices stated in other sections.

-END OF SECTION-

SECTION 03600 – GROUT AND MORTAR

PART 1 - GENERAL

1.01 SCOPE

A. This section covers the work necessary for structural, miscellaneous, and other uses of grout as indicated on the Drawings, complete.

1.02 QUALITY CONTROL

A. To demonstrate conformance with the specified requirements for grout, the Contractor shall provide the services of an independent testing laboratory that complies with the requirements of. The testing laboratory shall sample and test grout materials as required in this section. Costs of testing laboratory services shall be borne by the Contractor.

1.03 SUBMITTALS

A. The following information shall be provided:

1. **Manufacturer's Data:**
   Manufacturer's Data is required for the following:

   a. Bonding compounds
   b. Non-shrink grout
   c. Masonry mortar
   d. Pressure grout
   e. Admixtures
   f. Epoxy grout
   g. Polymer concrete

2. **Laboratory Test Reports:**
   Test reports on previously tested materials shall be accompanied by the manufacturer's statement that the previously tested material is the same type, quality, manufacture, and make as that proposed for use in this project. Test reports are required for the following:

   a. Cement
   b. Aggregates
   c. Admixtures
   d. Bonding compounds
   e. Epoxy resin
   f. Non-shrink grout
   g. Masonry mortar

1.04 TESTING

A. The City reserves the right to have test samples taken and tested by an approved testing laboratory to verify strength of the grout and mortar. Acceptance and evaluation of the grout and mortar strengths shall be by the City in accordance with CBC Section 2105A.2.2.1.4. Costs for testing shall be the responsibility of the City.

PART 2 - MATERIALS

2.01 MASONRY GROUT

A. Masonry grout shall conform to CBC Section 2103A.12 or 2103.12 and ASTM C476. Unless otherwise specified on the Drawings, masonry grout shall have a 28-day compressive strength of not less than 2,000 psi.

1. **Aggregate**
   Aggregate shall conform to ASTM C404, aggregates for masonry grout. Aggregate shall be non-reactive and shall be washed before use. When sources of aggregate are changed, test reports shall be provided for the new material. The tests specified shall be performed prior to commencing grout work.

2. **Cement**
   Portland cement shall be Type II-V low alkali. Milling data sheet shall be provided with submittal demonstrating compliance with ASTM C150, as last amended.

3. **Fly Ash**
   Class F coal fly ash as a raw or calcined natural pozzolan may be used to replace up to 25% by mass of Portland cement in concrete mixtures. Materials data sheet shall be provided with submittal demonstrating compliance with ASTM C618, as last amended.

4. **Hydrated Lime**
   Hydrated lime shall conform to the latest revision of ASTM C207, Type S. Quicklime shall conform to ASTM C5, pulverized. Lime putty shall be Quicklime, conforming to ASTM C1489.

5. **Water**
   Water for washing aggregate, mixing, and for curing shall be free from oil and deleterious amounts of acids, alkalis, and organic materials; shall not contain more than 1,000 mg/L of chlorides as Cl, nor more than 1,300 mg/L of sulfates as SO_4; and shall not contain an amount of impurities that may cause a change of more than twenty-five-percent (25%) in the setting time of the mix nor a reduction of more than five-percent (5%) in the compressive strength of the mix at 14-days when compared with the result obtained with distilled water. Additionally, water used for curing shall not contain an amount of impurities sufficient to

discolor the mix.

6. **Admixture**
   The grout shall contain an admixture of the type that reduces early water loss to the masonry units and produces and expansive action in the plastic grout sufficient to offset initial shrinkage and promote bonding of the grout to all interior surfaces of the masonry units. Admixtures shall meet the requirements of CBC Section 2103A.14 or 2114.3 and have an evaluation report meeting the requirements of IR A-5. The approval of the structural engineer is required for the use of any admixture.

   Admixtures shall be compatible with the grout. Calcium chloride or admixtures containing calcium chloride are not acceptable. Admixtures shall be used in accordance with the manufacturer's recommendations and shall be added separately to the grout mix.

   Water reducing admixture shall be ASTM C494 Type D and shall be Master Builders Pozzolith 300R, Sika Corporation Plastiment, or equal.

   Lubricant additive for cement pressure grouting shall be Intrusion Prepakt Intrusion Aid, Sika Intraplast N, or approved equal.

2.02 MASONRY MORTAR

A. Unless otherwise specified, masonry mortar shall conform to ASTM C270 and CBC Standard 21-15, Type S for foundation and exterior walls and other load-bearing or shear-wall masonry, and Type N for non-load-bearing, non-shear-wall interior masonry. Mortar shall conform to CALTRANS Standard Specifications Section 58-2.02C. Unless otherwise specified on the Drawings, masonry mortar shall have a 28-day compressive strength of not less than 2,000 psi in accordance with ASTM C109. Where colored mortar is specified to match the masonry units, add colorant to obtain the color indicated. Colorant shall be alkali-resistant iron oxide based and shall be Sonneborn "Sonobrite," Solomon Grind-Chem Service, Inc., "Concentrated Cement Color," or equal.

1. **Aggregate**
   Fine aggregate shall conform to ASTM C144, fine aggregate for mortar. Aggregate shall conform to ASTM C404, aggregates for masonry grout. Aggregate shall be non-reactive and shall be washed before use. When sources of aggregate are changed, test reports shall be provided for the new material. The tests specified shall be performed prior to commencing grout work.

2. **Cement**
   Portland cement shall be Type II-V low alkali. Milling data sheet shall be provided with submittal demonstrating compliance with ASTM C150, as last amended.

3. **Masonry Cement**

Masonry cement shall conform to ASTM C91. For masonry cement used in mortar for exterior walls, the air content of the mortar specimen shall be not more than 16-percent by volume. Containers shall bear complete instructions for proportioning and mixing to obtain the required types of mortar.

4. **Hydrated Lime**
   Hydrated lime shall conform to the latest revision of ASTM C207, Type S. Quicklime shall conform to ASTM C5, pulverized. Lime putty shall be Quicklime, conforming to ASTM C1489.

5. **Water**
   Water for washing aggregate, mixing, and for curing shall be free from oil and deleterious amounts of acids, alkalis, and organic materials; shall not contain more than 1,000 mg/L of chlorides as Cl, nor more than 1,300 mg/L of sulfates as SO_4; and shall not contain an amount of impurities that may cause a change of more than twenty-five-percent (25%) in the setting time of the mix nor a reduction of more than five-percent (5%) in the compressive strength of the mix at 14-days when compared with the result obtained with distilled water. Additionally, water used for curing shall not contain an amount of impurities sufficient to discolor the mix.

6. **Admixtures**
   Admixtures may be used in mortar to retard curing and provide additional workability, provided that the admixture does not adversely affect bonding or compressive strength. Water reducing admixtures shall be ASTM C494 Type D and shall be Master Builders Pozzolith 300R, Sika Corporation Plastiment, or equal. Set retarding admixtures shall be ASTM C494 Type B and shall be Master Builders Pozzolith 300R, Sika Corporation Plastiment, or equal.

7. **Color**
   Color shall be as shown on the plans or as selected by City.

2.03 NON-SHRINK GROUT

A. Non-shrink grout shall be a prepackaged, inorganic, non-gas-liberating, nonmetallic, cement-based grout requiring only the addition of water. Manufacturer's instructions shall be printed on each bag or container in which the materials are packaged. Non-metallic aggregate grout shall be Five Star Products Inc. Five Star Grout, Master Builders Masterflow 928, Burke Company Non-Ferrous, Non-shrink grout, or approved equal. Grout shall conform to CALTRANS Standard Specifications Section 58-2.02D. The specific formulation for each class of non-shrink gout specified herein shall be that recommended by the manufacturer for the particular application:

   <u>Class A</u>
   Class A non-shrink grout shall have a minimum 28-day compressive strength of 5,000 psi, no shrinkage (0%), a maximum four percent (4.0%) expansion in the plastic state when tested in

accordance ASTM C827, and shall have no shrinkage (0%) and a maximum of 2 tenths percent (0.2%) expansion in the hardened state when tested in accordance with CRD C621.Class A non-shrink grout shall be used for the repair of all holes and defects in concrete members which are water bearing or in contact with soil or other fill material, grouting under all equipment baseplates, and at all locations where grout is specified in the contract documents; except for those applications for Class B non-shrink grout and epoxy grout specified herein. Class A non-shrink grout may be used in place of Class B non-shrink grout for all applications.

Class B

Class B non-shrink grout shall have a minimum 28-day compressive strength of 5,000 psi and shall meet the requirements of CRD C621. Class B non-shrink grout shall be used for the repair of all holes and defects in concrete members which are not water-bearing and not in contact with soil or other fill material, grouting under all baseplates for structural steel members, and grouting railing posts in place.

2.04 EPOXY GROUT FOR CRACK REPAIR AND DOWEL ANCHORAGE

A. Except as noted below, epoxy grout shall be a high modulus, two-component, moisture insensitive, 100% solids, thermosetting modified polyamide epoxy compound. The consistency shall be a paste form capable of not sagging in horizontal or overhead anchoring configurations. Material shall conform to ASTM C881, Type 1, Grade 3, such as Master Builder Concresive 1440 Series, Sika Corporation Sikadur Hi-Mod Series, Adhesive Technology Corporation Solidbond 200 or equal, and shall have a heat deflection temperature in excess of 130-degrees F.

B. Epoxy for pressure grouting/crack injection shall be a two-component, moisture insensitive, high modulus, injection grade, 100% solids, blend of epoxy-resin compounds. The consistency shall be as required to achieve complete penetration in hairline cracks and larger. Material shall conform to ASTM C881, Type 1, Grade 1, such as Sika Corporation Sikadur 52, Master Builders Concresive LPL, Adhesive Technology Corporation SLV 300 Series, or equal.

2.05 POLYMER CONCRETE

A. Polymer concrete (for resurfacing or patching) shall consist of a liquid binder and dry aggregate mixed together to make a mortar or grout of a consistency as required for the application. The liquid binder shall be a chemical and oil resistant, stress relieved, low modulus, moisture insensitive, two-component epoxy-resin compound. The consistency shall be similar to lightweight oil for proper mixing with aggregate. Material shall conform to ASTM C881, Type 3, Grade 1, such as Sika Corporation Sikadur Lo-Mod Series, Adhesive Engineering Concresive 1470, Adhesive Technology Corporation 400 Series, or equal.

B. The aggregate shall be oven dry in sealed packages until time of mixing, and shall be of size and consistency compatible with recommendations of manufacturer of liquid binder for intended application.

2.06 ADHESIVE CAPSULES FOR DOWEL ANCHORAGE

A. Adhesive resin capsules shall consist of sealed glass capsules containing premeasured amounts of polyester or vinyl ester resin, quartz sand aggregate, and a hardener contained in a separate vial within the capsule. Adhesive capsules shall be Hilti HVA Capsules, Molly Parabond Capsules, or equal.

2.07 BONDING COMPOUNDS

A. Epoxy resin bonding compounds shall be used for wet areas and shall be Adhesive Engineering, Concresive Nos. 1001, 1001-LPL or 1180 as applicable; Sika Chemical Corporation, Sikadur 35, Hi-Mod LV, Sikadur 32, Hi-Mod, or Sikadur 31, Hi-Mod Gel as applicable; Burke Company 881 LPL Epoxy; or equal.

B. Non-epoxy bonding compounds shall be used for dry areas and shall be Burke Company, Acrylic Bondcrete; Imperial Chemical Industrial, Inc., Thoro System Products, Acryl 60; Thorobond; or equal. Bonding compounds shall be applied in accordance with the manufacturer's instructions.

2.08 PRESSURE GROUTING EQUIPMENT

A. Pressure grouting equipment shall include a mixer and holdover agitator tanks and shall be designed to place grout at pressures up to 50 psi. Gauges shall be provided to indicate pressure used. The mixer shall be provided with a meter capable of indicating to the one-tenth of a cubic foot (0.1 ft^3) the volume of grout used.

PART 3 - EXECUTION

3.01 MASONRY GROUT

A. Masonry grout shall be used for grouting reinforced masonry. All wall cells shall be filled solid with grout in accordance with the requirements of CALTRANS Standard Specifications Section 58-2.03, CBC 2103A.8 or 2103.8 and meet the requirements of ASTM C476.

B. Grout shall be mixed in volumetric proportions as follows:

Type	Parts by Volume of Portland Cement	Parts by Volume of Hydrated Lime or Lime Putty	Aggregate Measured in a Damp, Loose Condition	
			Fine	Coarse
Fine/Coarse Grout	1	0 to 1/10	2-1/4 to 3 times the sum of the volumes	1 to 2 times the sum of the volumes of the

			of the cementitious materials	cementitious materials

Mixing

Mixing shall be performed in accordance with ASTM C476. Only enough water shall be added to the mixture to produce a mixture which is flowable, but which will not show an excess of water when placed and will flow into all voids of the masonry without separation or segregation. Unless otherwise specified, concrete grout shall have a slump ranging from 8 to 11-inches. The total mixing time shall be 3 to 5-minutes per ASTM C270 Section 7.3.

Placement

Grout shall be placed from the interior side of walls, except as approved otherwise. Sills, ledges, offsets, and other surfaces shall be protected from grout droppings. Prior to grouting, the grout space shall be clean so that all spaces to be filled with grout do not contain mortar projections greater than 1/2-inch, mortar droppings, or other foreign material. Grout shall be well mixed to prevent segregation, shall be sufficiently fluid to flow into joints and around reinforcing without leaving voids, and shall be placed by pumping or pouring from buckets equipped with spouts.

The maximum height of a pour is limited by the practical considerations of segregation of grout due to the height of the free fall, the effect of dry grout deposits left on block projections, congestion due to reinforcing steel and embedded items, and the ability to effectively reconsolidate the grout. Unless specifically approved otherwise, the maximum height of pour will be 12-feet for walls with a nominal thickness of less than 12-inches, and 16-feet for walls with a nominal thickness of 12-inches or more. At grout pours exceeding 6-feet, cleanouts shall be provided in the bottom course at every vertical bar but shall not be spaced more than 32-inches on center for solidly grouted masonry. The cleanouts shall be sealed after inspection and before grouting. After grout has been placed, it shall be consolidated by use of a mechanical immersion vibrator.

Vertical cells to be filled with grout shall have vertical alignment sufficient to maintain a clear, unobstructed continuous vertical cell measuring not less than 2-inches by 3-inches. Pours shall be 1-1/2-inches below the top of masonry units in top course, except at the finish course. Grout shall be agitated thoroughly to eliminate voids. Masonry displaced by grouting operation shall be removed and re-laid in alignment with fresh mortar.

3.02 MASONRY MORTAR

A. Masonry mortar shall be used to bond joints of concrete masonry units and seal reinforced concrete pipe joints. Masonry mortar shall be placed in accordance with the requirements of CALTRANS Standard Specifications Section 51, Section 58-2.03 and Section 65-2.02F.

B. Mortar shall be mixed in volumetric proportions as follows:

Service and Type	Portland Cement	Hydrated Lime or Lime Putty	Sand (Max)
Type M, S	1	1/4	Not less than 2-1/4 and not more than 3 times the sum of the separate volumes of cementitious materials.

Mixing

Mortar shall be mixed in accordance with ASTM C270 to obtain type mortar required. Mortar materials shall be measured in 1 cubic foot containers to maintain control and accuracy of proportions; measuring materials with shovels is not permitted. Mortar shall be mixed in a mechanical batch mixer for not less than 3 nor more than 5-minutes after all ingredients are in so as to produce a uniform mixture. Water shall be added gradually as required to produce a consistency suitable for the purpose intended. Admixtures of hydrated lime, fire clay, diatomaceous earth or other approved inert material may be used in the mortar to facilitate workability if the Contractor elects. Unless otherwise specified, concrete grout shall have a slump ranging from 5 to 8-inches.

Mortar not formulated to include retarding admixtures, which has not been placed in final position within 1-1/2-hours after the initial mixing, shall not be retempered and used. No mixing off the job site, either complete or in part, will be allowed with exception for mixing of lime putty. Mortar left on hand when work is stopped shall be discarded. Use of antifreeze compounds, salts, or other substances to lower the freezing point of mortar is prohibited.

Where colored mortars are required, pigments may be added at the site or provided as part of prepackaged mortar mix. When masonry cement is used, mixing shall conform to printed instructions of the masonry cement manufacturer. Dosages and mixing of integral waterproofing shall conform to the manufacturer's recommendations.

Placement

Fully mortar web and face shells, head joints shall be at least as thick as CMU face shell thickness

3.03 NON-SHRINK GROUT

A. Non-shrink, nonmetallic aggregate grout shall be used for the bearing surfaces of machinery and equipment bases, column base plates, and bearing plates. Non-shrink metallic aggregate grout shall be used for setting anchor bolts and grouting reinforcing steel holes. Grout shall meet the requirements of CRD-C621 and shall be placed in accordance with manufacturer's instructions.

B. Holes required for grouting shall be blown clean with compressed air and left free of dust or

standing water. Horizontal holes for grouting shall be drilled at a slight downward angle to facilitate holding the grout until setting is complete. Bolts or reinforcing steel installed in horizontal grout holes shall be bent slightly accordingly.

3.04 EPOXY GROUT

A. Epoxy grout shall be used for repairing cracks by pressure grouting or gravity flow, repairing structural concrete, and may be used for setting reinforcing dowels or anchor bolts into holes for grouting. Concrete shall be primed in accordance with the grout manufacturer's instructions.

B. Use of epoxy grout for anchorage of bolts or reinforcing dowels shall be subject to the following conditions:

1. Use shall be limited to locations where exposure, on an intermittent or continuous basis, to acid concentrations higher than 10-percent, to chlorine gas, or to machine or diesel oils, is extremely unlikely.

2. Use shall be limited to applications where exposure to fire or exposure to concrete or rod temperature above the product's heat deflection temperature or 120-degrees F (whichever is less) is extremely unlikely. Overhead applications (such as pipe supports) shall be disallowed.

3. Approval from the Engineer for specific application and from supplier of equipment to be anchored, if applicable.

4. Anchor diameter and grade of steel shall be per the contract documents or per supplier specifications. Anchor shall be threaded or deformed full length of embedment and shall be free of rust, scale, grease, and oils.

5. Embedment depth and hole diameter shall be as specified.

6. Holes shall have rough surfaces, such as can be achieved using a rotary percussion drill.

7. Holes shall be blown clean with compressed air and be free of dust or standing water prior to application of grout.

8. Anchor shall be left undisturbed and unloaded for full curing period.

9. Anchors shall not be placed in concrete below 40-degrees F.

3.05 ADHESIVE CAPSULES

A. Adhesive resin capsules may be used for setting and anchoring reinforcing dowels or anchor bolts into predrilled holes in concrete. Use of the adhesive resin capsules for anchorage of

reinforcing dowels or bolts shall be subject to conditions 1 through 4 and 6 through 9, as listed in preceding paragraphs under Section 3.04 Epoxy Grout and as herein specified.

B. Embedment depth shall be as specified. Adhesive capsules of different diameters may be used to obtain proper volume for the embedment, but no more than two capsules per anchor may be used. When installing different diameter capsules in the same hole, the larger diameter capsule shall be installed first. Any extension or protrusion of the capsule from the hole is prohibited.

3.06 PRESSURE GROUTING

A. Prior to grouting, systems and holes to be grouted shall be washed clean. Washing is not required for grouting soil voids outside pipe cylinders or casing pipes. Grouting, once commenced, shall be completed without stoppage. In case of breakdown of equipment, the Contractor shall wash out the grouting system sufficiently to ensure fresh grout and adequate bond and penetration will occur upon restarting the grouting operation. Grout pressure shall be maintained until grout has set.

3.07 CURING

A. Drypack grout, cement grout, and non-shrink grout shall be protected from direct rays of the sun, drying winds, and wash by rain, when possible. Non-shrink grout shall be protected against rapid loss of moisture by covering with wet cloth or polyethylene sheets. After edge finishing is completed, the grout shall be wet cured for at least 3-days and then an acceptable membrane curing compound shall be applied.

PART 4 – MEASUREMENT AND PAYMENT

No separate payment will be made for Grout and Mortar. Payment for work in this section shall be included as part of the applicable Lump Sum or Unit Prices stated in other sections.

-END OF SECTION-

SECTION 04200 - CONCRETE MASONRY UNITS

Bid Item No. 12

PART 1 - GENERAL

1.01 SCOPE

A. This section covers the work necessary for furnishing and installing concrete masonry units, anchors, sleeves, frames, structural steel, lintels, anchor bolts, and all other items required, complete.

1.02 GENERAL

A. Concrete masonry structures shall be constructed of units of the types, dimensions, arrangements, and coursing indicated on the Drawings and specified herein, complete with all materials, accessories, and appurtenances as indicated, specified, or required.

1.03 SUBMITTALS

A. Before masonry construction can begin, the following drawings, data, specimens, and samples shall be submitted in accordance with SECTION 01330 – PROJECT RECORDS AND SUBMITTALS, and these items:

1. Results of mortar compressive strength performed in accordance with California Building Code (CBC) Chapter 19.

2. Results of tests of compressive strength of concrete grout in accordance with CBC Chapter 19.

3. Cold and hot weather construction procedures.

4. Results of tests of masonry units and materials; certified test reports of three sample concrete masonry units of each type proposed to be used on the job, performed by an independent testing laboratory acceptable to the Engineer, indicating that the material proposed for use meet the requirements of these specifications. Test results shall include, but not be limited to, compressive strength, linear shrinkage, total absorption, moisture content as a percent of total absorption, and unit weight. Tests shall be performed in accordance with ASTM C90, C140, and C426.

5. Two full-size concrete masonry unit samples of each type of masonry unit proposed for color and quality approval.

6. Drawings showing placement of all rebar within masonry units.

1.04 STORAGE AND HANDLING

A. All masonry units shall be handled in a manner that will prevent soiling, chipping, or damage of any kind. Broken, discolored, chipped, or otherwise damaged facing units will be rejected and shall be replaced with undamaged units.

B. Masonry units shall be stored on pallets and shall be protected against contamination and staining. Masonry units shall be kept covered and dry at all times. Lime and cement shall be stored under cover in a dry place.

C. Sand shall be stored so that the inclusion of foreign materials is prevented. Whenever sand is piled directly on the ground, the surface beneath the sand shall be smooth, well drained, and free from dust, mud, and debris. The bottom six inches (6”) of each pile of sand placed directly on the ground shall not be used in mortar.

PART 2 - MATERIALS

2.01 GENERAL

A. Unless otherwise indicated on the drawings, masonry unit sizes are indicated in inches. Sizes of masonry units are nominal, the actual size being slightly smaller to allow for mortar joints. All materials shall meet the CBC requirements. Concrete masonry units shall be of modular dimensions and air, water, or steam cured. Unless otherwise specified, exposed surfaces of units shall be comparatively smooth and of uniform texture. Special surface texture or, architectural faces shall be provided where specified. Surfaces of units which are to be plastered or stuccoed shall be sufficiently rough to provide a suitable bond. Special shapes and proper sizes shall be used to provide for all window and door openings, bond beams, piers, lintels, and other special applications with minimum block cutting. Concrete masonry units, as indicated on the drawings, shall be as manufactured by Calstone Company, Best’s Blocks Inc., Superlite Builders Supply Company, Pyramid Block Company, or equal.

2.02 HOLLOW LOAD BEARING UNITS

A. Hollow load bearing concrete masonry units shall conform to ASTM C90 and CBC, Chapter 21, made with lightweight or normal weight aggregate. Load bearing units shall be provided, unless otherwise specified. Unless otherwise specified on the Drawings, hollow load bearing concrete masonry units shall have a 28-day compressive strength of not less than 2000 psi.

2.03 HOLLOW NON-LOAD BEARING UNITS

A. Hollow non-load bearing concrete masonry units, where specified, shall conform to ASTM C129, Type 1, made with lightweight or normal weight aggregate.

2.04 CONCRETE BUILDING BRICK

A. Concrete building brick shall conform to ASTM C55, Grade N, Type I, and shall be made with lightweight or normal weight aggregate. Concrete brick shall match the concrete masonry units in color and surface characteristics.

2.05 COLOR

A. Color of masonry blocks shall be as shown on the plans or as selected by City.

2.06 REINFORCING STEEL

A. Reinforcing bars shall meet the requirements of ASTM A615 as last amended, for structural grade, deformed bars, (except that 1/4" shall be plain rounds). No. 5 bars and smaller shall be minimum Grade 40, No. 6-bars and larger shall be Grade 60.

2.07 POLYETHYLENE FILM

A. Polyethylene Film shall conform to product standard PS17; 6-mils.

2.08 WATER-RESISTANT PAPER

A. Water-resistant paper shall be Fortifiber Corporation, “Sisalkraft” reinforced building construction paper or equal.

PART 3 - EXECUTION

3.01 MORTAR JOINTS

A. Masonry shall be laid in straight, level, uniform courses. Mortar joints shall be a uniform thickness of 3/8-inch with a variance of no more than 1/8-inch for both vertical and horizontal joints unless otherwise specified. Exposed joints shall be tooled slightly concave with a round or other suitable jointer when the mortar is thumbprint hard except where otherwise required to match existing construction. For horizontal joints, jointers shall be at least 12-inches long for brickwork and 16-inches long for concrete masonry. Jointers shall be slightly larger than the width of the joint so that complete contact is made along the edges of the units, compressing and sealing the surface of the joint. Joints that will not be exposed shall be struck flush. Vertical joints shall be tooled first. Both horizontal and vertical joints on the outside of the walls shall be raked. All joints on the inside of the surfaces of the walls shall be flush. The surfaces of the walls must be kept clean and free of mortar splotches. Horizontal joints shall be level; vertical joints shall be plumb and in alignment from top to bottom of wall within a tolerance of plus or minus 1/2-inch in 40-feet.

B. Weep holes shall be placed at a maximum spacing of 48-inches at the base of cavity walls or

veneer walls and in the course bearing on through-wall flashing.

C. In laying up concrete block masonry, abutting surfaces of head joints shall be completely and solidly cemented together with mortar. All hollow masonry units with horizontal cells shall be laid on a full bed of mortar. All starter courses with vertical cells shall be laid on a full bed of mortar. All units in masonry pilasters shall be laid on a full bed of mortar.

D. The filling of masonry joints shall mean that the entire space between abutting surfaces of units is full, and that the body of the mortar is forced against and into the porous surface of each unit.

E. All exposed interior mortar joints shall be tooled to a smooth uniform surface and finished free from voids, using a rounded tool. Mortar joints specified to be caulked shall be raked to a depth of ½". Tooling of joints shall be regulated so that the mortar for each wall space has a uniform appearance.

3.02 BONDING AND REINFORCING

A. Reinforcing bars shall be in place and reviewed by the Engineer before grouting shall begin.

B. All reinforcements shall be clean and free of paint, loose rust, scale, and shall be securely held in place and tied at all intersections, corners, and splices with #16-gauge minimum annealed wire.

   Vertical reinforcement shall be held in position at top and bottom and at intervals not exceeding 200 diameters of the reinforcement, nor 10-feet. Bars shall be held in position by steel wire bar positioners or tied to dowels with wire ties.

C. Where horizontal and vertical bars are spliced and adjacent lap splices are separated by more than 3-inches, the lap splice length shall not be less than 72-bar diameters. Where adjacent lap splices are separated by 3 inches or less, the lap splice length shall be increased by 1.3 times or the lap splices may be staggered at least 24-bar diameters with no increase in length.

D. Where vertical reinforcement occurs, cores shall be filled solid with grout, and units laid in such a manner as to preserve the unobstructed vertical continuity of cores to be filled. Adjacent webs shall be embedded in mortar to prevent leakage of grout, and mortar fins protruding from joints removed before grout is placed. Minimum clear dimensions of vertical cores shall be 2 by 3 inches.

E. Reinforcing shall be positioned and held accurately before placing grout by tying or by using bar positioners at maximum 8-foot intervals. Vibrator shall be used to consolidate the grout. Minimum clear distance between masonry and vertical reinforcement shall be 1/2-inch. Unless otherwise specified, splices shall be formed by lapping bars not less than 40-bar diameters.

F. Except where otherwise indicated on the drawings, all masonry walls shall be laid in running bond with concrete masonry units centered overhead joints. All masonry shall be grouted solid

and shall be reinforced and anchored in the manner indicated on the contract drawings and specified herein.

3.03 BOND BEAMS

A. Bond beams shall be made up of special bond-beam blocks with horizontal bar reinforcement. Horizontal bar reinforcement shall be solidly grouted in place.

3.04 LAYING MASONRY UNITS

A. All masonry units shall be free from dust, dirt, and surface moisture when laid. Concrete blocks shall be dry when laid. All masonry shall be laid to a line. Walls shall be plumb and straight and in level courses. At no time shall masonry construction at any point be more than 8-feet above adjacent work. When work is suspended, the tops of exterior masonry walls shall be covered and protected from the weather. Care shall be taken in corner construction and at jambs to maintain uniformity of appearance and to ensure that only whole, undamaged units are used. All corner blocks shall be well filled and tooled to a dense surface both inside and outside.

B. The first course shall be laid in a full bed of mortar for the full width of the unit. Succeeding courses shall be laid in running bond unless otherwise specified. Bed-joints shall be formed by applying the mortar to the entire top surfaces of the inner and outer face shells and to head joints by applying the mortar for a width of about 1-inch to the ends of the adjoining units. The mortar shall be of such thickness that it will be forced out of the joints as the units are placed in position. Where anchors, bolts, and ties occur within the cells of the units, metal lath shall be placed in the joint at the bottom of such cells and the cells filled with mortar or grout as the work progresses. Except at grouted or reinforced masonry, concrete brick shall be used for bonding walls, working out the coursing, topping out walls under sloping slabs, distributing concentrated loads, backing brick headers, and elsewhere as required. Concrete masonry units shall not be dampened before or during laying.

3.05 CONTROL JOINTS

A. Control joints shall be placed where shown on the drawings, or if not shown, a minimum of 25-feet apart or 1.5 times the height of the wall, whichever is less. Locations of control joints to be determined by Engineer in the field. Control joints shall be full height and continuous in appearance. Bond beams and bond beam reinforcing bars shall be continuous through the control joint. The control joint shall be caulked and shall be mortar joint in appearance. Fill material for control joints shall be pre-molded, wide flange control joint filler as specified elsewhere herein. Caulking shall also be as specified elsewhere herein. All joints shall be caulked to produce a weather-tight structure.

3.06 LOW TEMPERATURES

A. When the surrounding air is below 40-degrees F or when the outside temperature is likely to fall

below freezing at any time during the 24-hour day, the following precautions shall be taken to prevent freezing of freshly laid masonry:

1. In addition to the protection specified for ordinary conditions, masonry materials shall also be kept from contact with snow, ice, or dampness of any kind.

2. The mixed mortar shall have a temperature between 70-degrees F and 120-degrees F. Warm mixing water shall be used, but water temperature shall not exceed 165-degrees F. If necessary, sand shall be heated also. Mortar mixing equipment shall be heated before it is used. The use of salt or calcium chloride is prohibited.

3. Masonry units shall be free of ice and snow and shall be above freezing when laid. If the outside temperature is below 30-degrees F, units shall be heated to at least 40-degrees F. If the temperature is below 0-degrees F, units shall be heated to at least 60-degrees F. Heating shall be done in a way that will prevent any damage to units.

4. Units shall not be laid upon a surface that is frozen or covered with snow or ice.

5. Masonry laid during freezing weather shall be kept warm for at least 3-days after laying. The air at the masonry surface shall be kept between 45-degrees F and 90-degrees F. Heating shall be done by methods that will not unduly dry out or otherwise damage the masonry. Heat shall be applied to both sides of the wall; arrangement being made for proper circulation of air. The masonry shall be suitably housed or covered.

3.07 HIGH TEMPERATURES

A. When the ambient air temperature exceeds 99-degrees F in the shade and the relative humidity is less than 50-percent, masonry shall be protected from direct exposure to wind and sun during erection and for 48-hours thereafter.

3.08 CUTTING OF MASONRY UNITS

A. Concrete masonry units shall be cut as required to form chases, for anchorage, or for other appurtenances. All cutting and fitting of exposed block units shall be done with a power driven carborundum or diamond disc blade saw.

3.09 OPENINGS AND LINTELS

A. Openings in masonry walls, unless indicated on the Drawings or specified otherwise, shall have lintels made up of like units, or bond beam units, reinforced and filled solidly with grout to properly span the opening.

B. Solid bottom bond beam block shall be used where the underside of lintel is exposed. Contractor shall provide a minimum of eight (8”) inches bearing at each end of lintel. Reinforcing bars shall

extend not less than 24-inches nor less than 40-bar diameters into the wall past the edge of the opening, on each side of the opening unless a greater length is indicated on the contract drawings. At corners, Contractor shall provide a 90-degree bend with an equivalent total embedment.

3.10 FINISH POINTING

A. Upon completion of the work, all exposed masonry shall be pointed where necessary and all voids and holes in the mortar filled to match adjacent joint surfaces. Defective joints shall be cut out and repointed with mortar. Care shall be taken to produce a uniform overall appearance. Spottiness due to variation either in materials or workmanship will not be acceptable.

3.11 PROTECTION FROM DAMAGE

A. Masonry and all embedded or built-in items shall be carefully protected from damage. Masonry walls discolored by paint, mortar, or concrete shall be rebuilt with new materials.

B. Whenever concrete is placed adjacent to previously constructed masonry, the masonry shall be adequately protected against splashing of concrete paste and other damage.

C. Where concrete is placed on top of previously constructed masonry, the masonry shall be protected from concrete splashing, spilling, and water penetration by polyethylene film or Sisalkraft paper placed on top of the masonry and extended down each side of the wall as required for adequate protection. The protective covering shall be neatly trimmed away at face of wall after form removal.

3.12 ANCHOR BOLTS

A. A six inch (6”) minimum width of grouted hollow masonry shall be provided all around anchor bolts and other attachment locations. Anchor bolts shall be held in place by a template to assure precise alignment of anchor bolts. Cutting or reaming of members being anchored or other means of accommodating misaligned anchor bolts in support angles will not be accepted.

3.13 CLEANING

A. Following finish pointing, all exposed masonry surfaces shall be carefully cleaned and all surface stains removed.

B. Mortar smears or droppings on concrete blocks shall be removed with a steel trowel. Removal shall not be attempted until the smears or droppings have hardened to the extent necessary to prevent additional smearing of the surface during removal. Mortar remaining after removal with the trowel shall be removed as much as possible by rubbing with a small piece of block. All surfaces shall then be thoroughly brushed.

3.14 ENCLOSURES

A. Where concrete masonry is to enclose conduits, pipes, stacks, ducts, and similar items, chases, cavities, and similar spaces shall be constructed as required, whether indicated on the Drawings or not. Openings around flush mounted electrical outlet boxes, including the flush joint above the box, shall be pointed with mortar. No such work shall be covered until advised by the Engineer that the work has been inspected and tested.

3.15 PATCHING

A. Patching of exposed concrete masonry units shall be done at the conclusion of the general work and shall be done so the patching will be indistinguishable from similar surroundings or adjoining work.

3.16 WATER CURING

A. Masonry shall be protected against too rapid drying by frequently fogging or sprinkling so that walls will always be visibly damp for a period of not less than three days.

PART 4 – MEASUREMENT AND PAYMENT

All work as specified herein, satisfactorily completed, shall be paid for on a Lump Sum basis as stated in **Bid Item Schedule** for the item listed below:

Bid Item No. 12 – CONCRETE MASONRY UNITS

-END OF SECTION-

SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.01 SCOPE

A. This section covers the work necessary to furnish and install structural steel complete.

1.02 SUMMARY

A. General

Extent of structural steel work is shown on contract drawings, including schedules, notes, and details to show size and location of members, typical connections, and type of steel required.

B. Work

Structural steel work is to be completed as defined in the American Institute of Steel Construction (AISC) "Code of Standard Practice" and as otherwise shown on Drawings.

C. Source Quality Control

Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements. Materials or fabricated components, which do not comply, shall be promptly removed and replaced.

D. Design of Members and Connections

Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work. Promptly notify Engineer whenever design of members and connections for any portion of structure are not clearly indicated.

1.03 SUBMITTALS

A. Product Data

Submit producer's or manufacturer's specifications and installation instructions for the following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.

2. High-strength bolts (each type), including nuts and washers.

3. Structural steel primer paint.

4. Shrinkage resistant grout.

B. Shop Drawings

Submit shop drawings prepared under supervision of a registered professional engineer, including complete details and schedules for fabrication and assembly of structural steel members, procedures and diagrams.

1. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS A2.1 and A2.4 symbols, and show size, length, and type of each weld.

2. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of other sections.

C. Test Reports

Submit copies of reports of tests conducted on shop and field bolted and welded connections. Include data on type(s) of tests conducted and test results.

1.04 QUALITY ASSURANCE

A. Codes and Standards

Comply with provisions of following, except as otherwise indicated:

1. AISC "Code of Standard Practice for Steel Buildings and Bridges."

2. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings" including "Commentary" and Supplements thereto as issued.

3. AISC "Specifications for Structural Joints using ASTM A325 or A490 Bolts" approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.

4. American Welding Society (AWS) D1.1 "Structural Welding Code - Steel."

5. ASTM A6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use."

6. California Building Code, latest edition.

B. Qualifications for Welding Work

Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure."

1. Provide certification that welders to be employed in work have satisfactorily passed AWS

qualification tests.

2. If re-certification of welders is required, re-testing will be Contractor's responsibility.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to site at such intervals to insure uninterrupted progress of work.

B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not delay work.

C. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.

D. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures as directed.

PART 2 - MATERIALS

2.01 METAL SURFACES, GENERAL

A. For fabrication of work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.

2.02 STRUCTURAL STEEL SHAPES, PLATES AND BARS

A. Structural steel shapes, plates, and bars shall conform to ASTM A36.

2.03 COLD-FORMED STEEL TUBING

A. Cold-formed steel tubing shall conform to ASTM A500, Grade B.

2.04 STEEL PIPE

A. Steel pipe shall conform to ASTM A53, Type S, Grade B.

2.05 HEADED STUD-TYPE SHEAR CONNECTORS

A. Headed stud-type shear connectors shall conform to ASTM A108 and shall be Grade 1015 or 1020, cold finished carbon steel; with dimensions complying with AISC Specifications.

2.06 ANCHOR BOLTS

A. Anchor bolts shall conform to ASTM A307 and shall be non-headed type unless otherwise indicated.

2.07 UNFINISHED THREADED FASTENERS

A. Unfinished threaded fasteners shall conform to ASTM A307 and shall be Grade A, regular low-carbon steel bolts and nuts. Provide hexagonal heads and nuts for all connections.

2.08 HIGH-STRENGTH THREADED FASTENERS

A. High strength structural bolts, heavy hexagonal nuts, and hardened washers shall be quenched and tempered, medium-carbon steel bolts, nuts and washers, complying with ASTM A325.

2.09 ELECTRODES FOR WELDING

A. Electrodes for welding shall comply with AWS Code.

2.10 STRUCTURAL STEEL PRIMER PAINT

A. See SECTION 09900 - PAINTING for requirements.

PART 3 - EXECUTION

3.01 FABRICATION

A. Shop Fabrication and Assembly

Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop Drawings. Provide camber in structural members where indicated.

1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.

2. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.

3. For fabrication of work, which will be exposed to view, use only materials that are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.

B. Connections

Weld or bolt shop connections, as indicated. Bolt field connections, except where welded connections or other connections are indicated. Provide threaded fasteners as indicated on structural drawings.

C. High-Strength Bolted Construction

Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A325 or A490 Bolts" (RCRBSJ).

D. Welded Construction

Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work. Assemble and weld built-up sections by methods that will produce true alignment of axes without warp.

E. Holes for Other Work

Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on final shop Drawings.

1. Provide threaded nuts welded to framing, and other specialty items as indicated to receive other work.

2. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.

3.02 SHOP PAINTING

A. Shop painting shall conform to SECTION 09900 – PAINTING**.**

3.03 ERECTION

A. Temporary Shoring and Bracing

Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.

B. Temporary Planking

Provide temporary planking and working platforms as necessary to effectively complete work.

C. Setting Bases and Bearing Plates

Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.

1. Set loose and attached base plates and bearing plates for structural members on wedges or

other adjusting devices.

2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.

3. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.

4. Comply with manufacturer's installation instructions for grouting.

D. Field Assembly

Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure within specified AISC tolerances.

2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.

3. Splice members only where indicated and accepted on shop drawings.

E. Erection Bolts

On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surfaces.

1. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

2. Do not enlarge unfair holes in members by burning or by use of drift pins. Ream holes that must be enlarged to admit bolts.

F. Gas-Cutting

Do not use gas-cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members that are not under stress, as acceptable to Engineer. Finish gas-cut sections equal to a sheared appearance when permitted.

G. Touch-Up Painting

Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting. Apply by brush or spray to provide minimum dry film thickness of 1.5 mils.

3.04 QUALITY CONTROL

A. Testing

City will engage an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.

1. Testing agency shall conduct and interpret tests and state in each report whether test specimens comply with requirements, and specifically state any deviations found.

2. Contractor shall provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.

3. Testing agency may inspect structural steel at plant before shipment; however, Engineer reserves right, at any time before final acceptance to reject material not complying with specified requirements.

B. Deficiency Correction

Correct deficiencies in structural steel work which inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as may be necessary to reconfirm any non-compliance of original work, and as may be necessary to show compliance of corrected work.

PART 4 – MEASUREMENT AND PAYMENT

No separate payment will be made for Structural Steel. Payment for work in this section shall be included as part of the applicable Lump Sum or Unit Prices stated in other sections.

-END OF SECTION-

SECTION 06100 - ROUGH CARPENTRY

PART 1 – GENERAL

1.01 SCOPE

A. This section covers the work necessary to furnish and install rough carpentry, including wood platform framing, plywood, sleepers, nailers, blocking, screeds, grounds, rough bucks, ledgers as required, rough hardware and fasteners, complete.

1.02 REFERENCE SPECIFICATIONS

A. Lumber, unless otherwise noted, shall be legible trade and grade marked, well-seasoned S45, coast region Douglas Fir, conforming to the applicable pattern, sizes and grades in the Standard Grading and Dressing Rules No. 16 of the West Coast Lumber Inspection Bureau. Plywood, unless otherwise noted shall be identified with the DFPA grade trademark of the American Plywood Association and shall meet the requirements of the U.S. Product Standard PS 1-83.

PART 2 – MATERIALS

2.01 LUMBER

A. General

All Lumber shall be individually selected so that knots and obvious defects will not interfere with placing bolts or proper nailing or making the proper connections. All defective parts, which will render a piece unable to serve its intended function shall be cut out and discarded. Lumber may be rejected by the Engineer, whether or not it has been installed, for excessive warp, twist, bow, crook, mildew, fungus, or mold, as well as due to improper cut and fit.

B. Framing Lumber Grades

Douglas Fir (DF) unless otherwise noted. Lumber designated DF South by WWPA is not acceptable. All lumber shall be new with no reuse except as permitted by Engineer. Moisture content for lumber 2-inches and less in thickness shall average 19-percent or less at the time of installation. All 2-inch nominal lumber shall be not less than 1-1/2-inches thick.

C. General Framing Lumber

General framing lumber shall be No. 2 (DF) 2-inch x 4-inch nominal studs. Light framing: WCLB Paragraph 124b.

D. 2x6 Studs, Joists

No. 2 (DF) 2-inch x 6-inch nominal studs, joists, planks: WCLB Paragraph 123b.

2.02 PLYWOOD

A. Roof structural sheathing shall be APA Structural 1 rated exterior glue conforming to U.S. Products Standard PS 1-83 or C-D Interior with exterior glue in conformance with PS 1-74. Thickness and type as indicated on the Drawings.

2.03 PRESSURE-TREATED LUMBER

A. Koppers Wolmanized Lumber or Osmose K-33 Pressure Preserved Wood conforming to American Wood Preservers Bureau Standard LP-2 for normal exposure and FDN for foundation material in the ground.

2.04 ROUGH HARDWARE

A. Furnish all items of rough hardware, connections to metal studs, bolts, etc., required to complete the work. Bolts, nuts and washers shall be hot-dipped galvanized, conforming to ASTM A153. Washers shall be malleable iron. Hardware for attaching blocking to metal studs shall also be galvanized.

1. **Nails**
   Common wire nails or spikes conforming to CBC Table 2304.9.1 and Federal Specification FF-N-101. Use galvanized nails for all exposed framing. Nails shall be untreated steel for interior work on concealed framing. Nails shall be galvanized for use in pressure treated lumber.

2. **Bolts**
   Standard mild steel, hexagonal head machine bolts with matching nuts and malleable iron or steel plate washers.

3. **Lag Bolts and Screws**
   Conform to Federal Specification FF-B-561B, of sizes shown or noted on Drawings.

4. **Toggle Bolts**
   Galvanized conforming to Federal Specification FF-B-588B (2), of sizes shown or noted on Drawings.

5. **Concrete Anchors**
   Anchors shall be Wedge type concrete anchors with sizes as noted on the Drawings. Do not use expansion bolts or anchors where other type anchors are shown or noted on the Drawings.

6. **Power-Driven Fasteners**
   Power-Driven fasteners shall not be used except with prior acceptance from the Engineer in writing.

7. **Framing Anchors**
   Timber Fasteners, Inc., Universal Anchors Co., Simpson Company, or equivalent, galvanized framing connectors and joist hangers as detailed, not less than #26-gauge (USS) before galvanizing having minimum design and load capacity equal to the Simpson Company product noted on Drawings.

2.05 BUILDING PAPER

A. Building paper shall conform to "Federal Specification UU-B-790a," dated February 5, 1968.

2.06 WOOD PRESERVATIVE

A. Wood preservative shall conform to "Standard P-5," of the American Wood Preservers Institute, or as noted on the Drawings.

PART 3 – EXECUTION

3.01 GENERAL

A. Rough carpentry shall produce joints true, tight, and well nailed with all members assembled in accordance with the Drawings and with all pertinent codes and regulations.

B. Grade mark and mill identification of association having jurisdiction shall appear, distinctly legible, on each piece of lumber and plywood.

C. Install all wood framing, making proper provisions for work of other trades. Do all cutting of wood required to accommodate placing heating and ventilating, electrical, and other trades. Members shall not be touched, bored, or cut for pipes, ducts, conduits, or other reasons except as shown on the Drawings or as specifically approved in advance by the Engineer.

D. Fit neatly around all exposed items, such as outlet boxes, conduit, pipes and ducts.

E. Sills, joists, short studs, trimmers, headers, lintels, or other framing components, shall be shimmed.

F. All horizontal or sloped members shall be set with the crown up.

G. All framing members shall be aligned so that the finish subsurface will vary not more than 1/8-inch from the plane of surfaces of adjacent framing and furring members.

3.02 PRODUCT HANDLING

A. Store and handle materials in a manner to prevent deterioration, intrusion of foreign matter, or damage and immediately remove from premises any materials evidencing such and replace with

new material.

3.03 STORAGE OF MATERIALS

A. Carefully pile lumber off the ground in a manner to insure proper drainage, ventilation, and protection from weather. Store plywood and materials under cover.

3.04 LAYING OUT WORK

A. Before commencing work, check all lines and levels indicated and other such work that has been completed. Should there be any discrepancies; they must be reported in writing to the Engineer for correction or adjustment. In event of the failure to report discrepancies, the Contractor shall be held financially responsible for correction of any and all errors.

3.05 ITEMS BUILT INTO CONCRETE

A. Furnish anchor bolts indicated on the Drawings or otherwise required to attach wood plates, nailers and ledgers too concrete. Bolts to be 1/2-inch minimum diameter, threaded one end with 1-1/2-inch right angle bend opposite end. See Drawings for exact size and embedment. Deliver anchors bolts to the site promptly to be built in as work progresses.

3.06 WORKMANSHIP

A. Work shall be accurately constructed square, true, to required levels and lines, and adequately fastened and anchored to produce sturdy, rigid system of sufficient strength to support the loads.

3.07 PRESSURE-TREATED LUMBER

A. Lumber to be in contact with the ground on concrete shall be pressure-treated lumber as specified herein. Lumber shall be fabricated insofar as possible before treatment. Where lumber is cut after treating, the surface shall be brushed with at least two coats of wood preservative. Lumber shall be dried to a moisture content of not more than 19-percent after treatment.

3.08 SILLS

A. Bed in wet concrete to obtain a continuous bearing. Size all plates or sills and set level and true to line. Bolt down with bolts of size, length, and spacing indicated with a bolt not more than 9-inches from the end of any piece.

3.09 PLATES

A. Plates for partitions and walls shall be single at bottom and double at top, except as otherwise detailed. Splices in top plates shall be staggered not less than 48-inches unless noted otherwise on Drawings. Where plates are cut for passing pipes and similar items, they shall be reinforced

on both sides with 1/8 x3 x18-inch steel plates punched for 10d nails approximately 3-inches on center, staggered.

3.10 POWER DRIVEN ANCHORS

A. Where power driven anchors are acceptable for use, plates anchored to concrete floor shall be attached with pins not over 2-feet on center. All vertical furring shall be attached to concrete with pins not over 4-feet on center. Each pin shall penetrate the concrete to a minimum of 1-1/2-inches. Use washers with all pins. There shall be a minimum of 2 anchors for each member.

3.11 STUDDING

A. Furnish and set all columns and studding of size, center, and locations indicated on Drawings. Unless noted otherwise, studding for furring and partitions shall be 2 x 4-inches set 16-inches on center. Plates on concrete floors shall be attached to the slab by anchor bolts or power driven anchors where acceptable. Cripples shall run to the floor plates. Studs against concrete shall be anchored as described above. Studding over 8-feet tall shall be bridged at half height with herringbone bridging, double-nailed at each end.

3.12 JOISTS

A. Joists shall be set with crowning edge up. Where openings occur headers and supporting joists shall be doubled or tripled, provided as the case may be, and header and tail joists shall be hung on metal hangers. Joists abutting concrete shall be anchored as indicated on Drawings.

B. Solid blocking shall be at ends and over supports. Cross-bridging or solid blocking in spans shall be at mid-span or as shown on Drawings.

C. Include furring or stripping, properly shimmed and leveled, where shown or required for ceiling finishes.

3.13 FURRING, BLOCKING, AND BACKING

A. Furring, blocking and backing shall be furnished and installed where required for reception of wallboard, formation of architectural features, concealment of pipes, conduits, ducts, building specialties, and other fixtures. Contractor shall consult with the trades concerned and set furring and blocking they require. Include fire-retardant treated wood blocking for plaster and drywall partitions and walls where shown or required.

3.14 GROUND AND NAILING STRIPS

A. Dressed wood ground shall be furnished and installed as indicated or required for the attachment of finish materials to wood, concrete, masonry or other surfaces.

3.15 FRAMING OF OPENINGS

A. Openings shall be provided for mechanical and electrical equipment, ducts, etc. Where one or more joists are cut, the joists supporting the trimmers shall be doubled and well-spiked unless otherwise shown on Drawings. Where continuation of three or more joists are interrupted, the abutting headers and joist hangers shall be as shown on the Drawings.

3.16 BEARING SURFACES AND PLATES

A. All bearings shall be full unless otherwise indicated on the Drawings. Plates in contact with masonry or concrete shall be completely bedded to obtain a continuous bearing, to be well anchored and bolted as shown.

B. All bearings surfaces on which structural members are to rest shall be finished, so as to give sure and even support. Where framing members slope, the ends shall be cut or notched as required to give a uniform bearing surface.

3.17 BLOCKING

A. All blocking required to support all items of finish shall be installed, as well as to cut off all concealed draft openings.

B. All blocking shall be installed as required by the CBC or other applicable code.

C. Fire-blocks, when of wood, shall be two inches (nominal) in thickness by the full width of the opening being blocked. If the width of the opening is such that more than one piece of lumber is necessary, there shall be two thicknesses of 1-inch (nominal) material with joints are broken.

D. Fire-block shall be installed at the locations shown in the Drawings.

3.18 FRAMES FOR CABINETS

A. Frame all openings in walls required for the installation of cabinets and other items, including telephone and electrical terminals.

3.19 PLYWOOD

A. Install plywood with long dimension perpendicular to supports, studs, or joists. Install all roof sheathing as shown on Drawings. Sheathing shall have solid bearing under all edges and sheets shall be laid up with tight joint. Check sheathing on horizontal surfaces carefully as soon as it is laid to determine its adequacy to support workmen and the normal loads which it will receive. Protect sheathing from weather until siding or roofing is installed by applying building paper or polyethylene sheeting. Where underside of sheathing is to be left exposed, apply plywood with best face down.

B. All plywood shall be placed with face grain perpendicular to supports, continuously over at least two supports, except where otherwise specifically shown on the Drawings.

C. Joints shall be centered accurately over the supports; unless otherwise specifically shown on the Drawings. The end joints of plywood panels shall be staggered to achieve a minimum of continuity of joints.

D. All plywood shall be protected from moisture by use of all required waterproof coverings until such plywood has been covered with the next succeeding component or finish.

3.20 LUMBER FASTENINGS

A. Nailing and bolting of wood members shall conform to the minimum requirements of the latest edition of the CBC, Vol. 2, Chapter 23, and as specified herein and shown on the Drawings. Connectors shall be as called for on the Drawings, all fabricated by an accepted manufacturer's published instruction.

1. **Bolting**
   All bolted connections shall be retightened before final acceptance or, in the case of bolted connections in concealed locations, immediately before the area is sealed off.

2. **Nailing**
   Only common wire nails or spikes of the dimensions shown on the nailing schedule shall be used, except where otherwise specifically noted in the Drawings.

   For conditions not covered in the nailing schedule, provide penetration into the piece receiving the point of not less than 2 times the length of the nail or spike provided, however, that 16d nails may be used to connect two pieces of two-inch (nominal) thickness.

   All nailing shall be achieved without splitting wood. Pre-boring shall be allowed as required. All split members shall be replaced.

   Penetration of nails or spikes into pieces shall not be less than 1/2 the length of the nail or spike.

   Unless connectors are detailed or steel connectors indicated, nails shall not be driven closer together than 1/2 of their length nor closer to the edge of a member that 1/4 their length.

   Holes drilled for bolting shall be 1/16-inch larger in diameter than the bolts being used, and shall be straight and true, drilled from one side only.

   Bolt threads must not bear on wood; washers shall be used under the head and the nut where both bear on wood. Washers shall be used under all nuts.

Where lag-screws and wood-screws are used, pre-bored holes shall be the same diameter as the root of the thread; holes shall be enlarged to shank diameter for the length of shank.

Unless otherwise indicated on the Drawings or as required by pertinent codes and regulations, provide at least the following nailing:

NAILING SCHEDULE

Blocking to joist bearing	2-10d toenailed each side
Blocking to joist or stud	2-10d toenailed each side
One-inch brace to stud	2-8d face nailed
Two-inch brace to stud	2-16d face nailed
Built-up beams eight inches or less in depth	16d and twelve inches on centers, staggered
Joists and rafters to support at laps (twelve inches minimum)	2-10d toenailed each side
multiple joists	4-16d face nailed16d at twelve inches on centers, staggered
Joists to sill or girder	2-16d toenailed

3. **Washers**
   Provide all bolts and lag screws bearing on wood with washers of sizes indicated under heads and nuts, except that cut washers shall be used where shown on the structural Drawings.

4. **Framing Anchors, Connectors, and Hangers**
   See Drawings for required sizes and types.

3.21 ROUGH HARDWARE

A. Furnish and install all stock items of rough hardware as indicated or required, including clips, anchors, hangers, bolts, ties, and plates for connecting wood framing members to wood, concrete, masonry, or steel, except as specified to be provided under other sections.

B. Expansion bolts are to be used at the locations indicated on Drawings and shall be carefully installed in snug fitting smoothly drilled holes, all in accordance with the manufacturer's written instructions. Expansion bolts shall be installed so that the load acts on the bolts in shear rather than withdrawal. Expansion bolts shall be carefully located in order to eliminate the risk of damage too concrete, steel reinforcement, and other embedded items. Expansion bolts shall not be used except where first accepted by the Engineer in writing.

3.22 REMOVAL OF EXCESS MATERIAL

A. Remove excess debris as it accumulates. Do not store or permit debris to accumulate on the site. If Contractor fails to remove excess debris promptly, the Engineer reserves right to remove debris at the Contractor's expense. Burning will not be allowed.

3.23 CLEANING UP

A. Upon completion of Work remove all materials, equipment and tools. The Contractor shall remove all lumber, unused materials, concrete forms, temporary structures, and other facilities used during construction. The Contractor shall leave the premises clean, neat and orderly.

PART 4 – MEASUREMENT AND PAYMENT

No separate payment will be made for Rough Carpentry. Payment for work in this section shall be included as part of the applicable Lump Sum or Unit Prices stated in other sections.

-END OF SECTION-

SECTION 06170 - PREFABRICATED WOOD TRUSSES

PART 1 – GENERAL

1.01 SCOPE

A. This section covers the work necessary to furnish and install prefabricated wood roof trusses, including connectors, complete. See SECTION 06100 – ROUGH CARPENTRY for additional requirements.

1.02 QUALITY ASSURANCE

A. Acceptable Manufacturers
Prefabricated wood trusses shall be "Gang-Nail" wood trusses as designed by Automated Building Components, Inc. and fabricated by Truscom Roof and Floor Systems, North Highlands, California. Other designers/fabricators with products equal to these standards in all respects may be used.

B. Installers Qualifications
Installation shall be by manufacturer's authorized representative who is normally engaged in this business, employing skilled mechanics thoroughly trained and experienced in the type of installation required, and are completely familiar with the requirements of the work specified herein.

C. Reference Specifications
The design and fabrication criteria of all wood trusses shall meet with the "National Design Specifications for Stress-Grade Lumber and Its Fastenings" by National Forest Products Association (latest revision); "Timber Construction Standards" by American Institute of Timber Construction (latest revision); and "Design Specifications for Light Metal Plate Connected Wood Trusses" by Truss Plate Institute (latest revision), the same as if those specifications and all their references were set out in full herein.

D. Professional Engineer
All truss designs shall bear the name and seal and/or registration number of a registered Civil or Structural Engineer licensed in the State of California.

1.03 SUBMITTALS

A. Engineering Drawings and Shop Drawings
Submit the truss design and/or shop drawings for approval prior to the fabrication of any components. Truss designs shall contain the following information:

1. Pitch, span, dimensions and spacing of truss.

2. Truss bearing sizes and locations.
3. Design loading of truss and allowable stress increase.
4. Axial forces in each truss member.
5. Nominal sizes and location of connector plates at all joints.
6. Size, species and stress of grade of lumber for all truss members.
7. Camber.
8. Permanent lateral bracing as required by design to reduce buckling length of individual members only.
9. Handling and erection recommendations.

B. Fabricator's Certification

Contractor shall submit fabricator's certification that the products are precision fabricated to the specified design fabrication standards.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Fabricated trusses and subcomponents shall be so handled and stored that they are not subject to damage. If the trusses are to be stockpiled prior to erection, sufficient bearing points and/or bracing shall be provided to prevent excessive lateral bending or tipping over. All damaged trusses, which cannot be satisfactorily repaired to the satisfaction of the Engineer, shall be replaced at no additional cost to the City.

PART 2 – MATERIALS

2.01 LUMBER

A. All lumber used for truss members shall conform to the published stress ratings for the species and grades as set out in the official grading rules of the appropriate lumber association or as listed in the reference specifications, except wherever this specification, or notes on the Drawings or truss engineering design calls for lumber which exceeds the minimum set forth in the reference specification.

1. At the time of fabrication, the moisture content of all lumber shall be within proper limits, as stated in the reference specifications.

2. All lumber shall conform to the species and fully recognized nominal sizes shown on the Drawings or truss engineering designs. All members shall be cut from lumber bearing the proper grade-mark stamps of a recognized grading association or licensed lumber inspection agency. No lumber shall be used which does not appear to conform to proper dimensions and/or grades.

2.02 TRUSS CONNECTOR PLATES

A. All truss connector plates shall be manufactured from ASTM A446, Grade A prime commercial

quality galvanized sheer steel or no less than 20 gauge thickness which has a minimum yield of 33,000 psi and a minimum ultimate tensile strength of 45,000 psi. The corrosion resistant coating shall be ASTM A525, "Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, General Requirements", Coating Designation G90 or G60, or ASTM A591, "Standard Specifications for Electrolytic Zinc Coated Steel Sheets", Coating Class C, or such treatment as will give equivalent corrosion protection. This protective coating may be applied to the sheet steel before the connector plates are stamped out; it is not necessary to recoat the connectors after the stamping operation. All metal connectors shall be Gang-Nail Connectors and shall be marked "Gang-Nail". Connectors shall have a series of nail-like projections that are designed to separate the fibers of the wood into which they are pressed, in accordance with accepted nailing practices. All connector plated truss joints shall be designed using the plating method as set forth in TPI Standards. Where field assembly of truss subcomponents is necessary, the connections shall be in accordance with the details shown on the truss design drawings and approved by a Professional Engineer.

2.03 FABRICATION

A. All trusses and other roof structural components shall be fabricated in a properly equipped manufacturing facility of a permanent nature. They shall be manufactured by experienced workmen, using precision cutting and truss fabricating equipment, under the direct supervision of a qualified foreman. All trusses shall be fabricated under strict rules of inspection and quality control as the local code may require, open to the inspection of the Engineer or their representative at all times.

B. All truss members shall be accurately cut to length, angle and be true to line to assure tight joints for finished truss.

C. All truss members and connector plates shall be properly placed in special jigs and the members tightly clamped in place, remaining in that position until connector plates have been pressed into the lumber simultaneously on both sides of the joints.

D. Camber shall be built into the trusses, as noted on the engineering truss designs, by properly positioning the members into the fabricating jig.

E. Each truss shall be stamped with the name and address of the Gang-Nail Truss manufacturer.

PART 3 – EXECUTION

3.01 INSPECTION

A. Verify that framing to receive trusses is constructed true, free of irregularities and debris. Do not proceed with installation until unsatisfactory conditions are corrected.

3.02 ERECTION

A. Framing anchors and/or truss hangers shall be provided by the Contractor in accordance with the Drawings.

B. Field erection of the trusses, including items such as proper handling, safety precautions, temporary bracing to prevent toppling or dominoing of the trusses during erection, and any other safeguards or procedures consistent with good workmanship and good building practices, shall be the responsibility of the Contractor.

C. During the entire construction period, the contractor shall provide means for adequate distribution of concentrated loads so that the carrying capacity of any one truss and/or other component is not exceeded.

D. Proper erection bracing shall be installed to hold the trusses true and plumb and in a safe condition until permanent truss bracing and bridging can be solidly nailed in place to form a structurally sound roof framing system. All erection and permanent bracing shall be installed and all components permanently fastened before the application of any loads.

E. The permanent structural cross-bracing to ensure the overall rigidity of the roof system, shall be in accordance with the Drawings.

PART 4 – MEASUREMENT AND PAYMENT

No separate payment will be made for Prefabricated Wood Trusses. Payment for work in this section shall be included as part of the applicable Lump Sum or Unit Prices stated in other sections.

-END OF SECTION-

SECTION 07420 - COMPOSITE SHINGLE ROOFING

PART 1 - GENERAL

1.01 SCOPE

A. This section covers the work necessary to furnish and install all composite roofing and all accessories needed to form the roof and make it weather tight as specified and as shown on the Drawings, complete.

1.02 SUBMITTALS

A. Contractor shall make the following submittals.

1. **Samples**
   Prior to ordering products, submit manufacturer's standard color samples for City's selection. Prior to starting work, submit two, shingle samples showing shape and color for Engineers acceptance.

2. **Manufacturer's Installation Instructions**

1.03 QUALITY ASSURANCE

A. Contractor shall have two years or more of successful experience in installation of composite shingle roofing similar to requirements for this project.

B. Comply with Building Code Requirements.

C. UL90 Tested and certified system for wind-up lift.

1.04 WARRANTY

A. Manufacturer's Product Warranty
Warrant for fifty (50) years, following project delivery date, that roof will not rupture, fail structurally, or perforate.

B. Contractor's Warranty
Warrant shingles, flashing, sealants, fasteners, and accessories against defective materials and/or workmanship, to remain watertight and weatherproof with normal usage for two (2) years following project substantial completion date, and to repair or replace without additional cost to the City, any leaks and resulting damage to other materials and building contents as may occur.

PART 2 - MATERIALS

2.01 APPROVED MANUFACTURER

A. TAMKO Roofing Products, Inc. (EPOCH Composite Products, a TAMKO company)
P.O. Box 1404
Joplin, MO 64802
Phone: 800 641-4691, FAX: 800 841-1925

B. Alternative products with physical characteristics identical to Lamarite must be approved in writing by Engineer 14 days prior to General Contractor Bid Date. The pattern, finish and color of the shingles shall be selected by the Owner

2.02 COMPOSITE SHINGLES

A. Shingle Description: Shingles shall be manufactured from colorized mineral filled polymer. Lamarite Slate Composite Shingles simulate the look of natural slate. Lamarite Shingles are available in three sizes, 18” x 12”, 18” x 7” and 18” x 5” and are suitable for installation with exposures of 7”, 7 ½”, and 8”.

B. The Contractor shall submit samples with available pattern and color selections to the City for final approval.

2.03 ACCESSORY PRODUCTS

A. Underlayment: Moisture Guard Plus – TAMKO’s fiberglass reinforced self-adhering SBS modified asphalt underlayment with fine mineral surfacing. TW Metal & Tile Underlayment – TAMKO’s fiberglass reinforced self-adhering SBS modified asphalt underlayment with polymeric film surfacing. TAMKO NO. 30, NO. 30 UL, or NO. 30 ASTM organic felt underlayments. TAMKO Nail Fast, SBS modified organic utility underlayment. Non-perforated asphalt saturated organic felt that meets the requirements of ASTM D 226, Type II.

B. Flashing Metal: 26 gauge

C. Nails: Corrosion-resistant, 3/8” head x 1 ½” length, roofing nails

D. Sealant: Contractor grade one part urethane sealant

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

A. Color Variation: All Lamarite Slate Composite Shingles come with shade variation. Shade variation may occur differently from pallet to pallet. Application of the Shingles should not begin until ALL material has been delivered to the project site. Shade variation has been designed into the Shingles to provide a more realistic, random appearance. Because of shade

variation the applicator must take precautions to insure that the various shades of the Shingles are properly blended on the roof. Mix Lamarite Slate Composite Shingles from different pallets and bundles while installing to help assure randomness in the finished application. The applicator must periodically check work in progress from the ground to make sure that a color pattern does not occur. Lamarite Shingles are intended to have random shade variations when installed.

B. Application Temperature: Although temperatures below 45 degrees F. will not harm Shingles, cold temperatures may cause difficulty with the installation, including increased breakage during fastening. If Lamarite Shingles have been stored in temperatures below 45 degrees F., it is recommended that the Shingles be restored to a temperature above 45 degrees F. prior to installation. Lamarite Shingles will expand and contract with heat and cold and must be properly spaced to avoid buckling. Lamarite Shingles have been designed with spacer tabs on the sides to help assure proper spacing. It is recommended that Lamarite Slate shingles be stored in temperatures above 45 degrees F.

C. Nailing and Cutting: Lamarite Shingles are for application to roof decks capable of receiving and retaining nails that penetrate ¾” into the roof deck. Each Shingle should be applied with two corrosion-resistant, 3/8” head x 1-½” length, roofing nails using a pneumatic nail gun set to 100 psi. Do not allow the end of the nail gun to punch the product. Do not use staples. Drive nail heads flush with the shingle surface. Frequently check both the depth and pressure setting on the nail gun so nails are not over-driven. Over-driving nails may cause Lamarite Shingles to lift and will adversely affect the appearance of the roof. Lamarite Shingles can also be hand nailed using two corrosion-resistant roofing nails.

D. High Wind Areas/Zones, Fastening Application: Standard roofing nails or ring shank roofing nails (3/8” head x 1-1/2” length) can be used for high wind area/zone applications depending upon jurisdiction, check local building code requirements.

E. Nail Placement: Maximum shingle exposure 7-1/2”: place nail a minimum ¼” to a maximum ½” below the bottom edge of the designated nail area. Two nails per shingle. Important: Check Local Codes for applicable Product Testing and deck assembly requirements. ASTM D 3161, Class F (mod to 110 mph), test assembly: nominal ¾” thick AC plywood deck, shingle underlayment, 1-1/2” roofing nails, two nails per shingle. UL 580, Class 90; UL 1897, 165 psf. The following assembly was used to obtain a Class 90 uplift resistance under the UL 580 Standard and, 165 psf uplift resistance rating under the UL 1897 Standard. Wood supports (Joists or Rafters) Nominal 2” x 10” deep wood framing members, No. 2 grade Spruce-Pine-Fir, 24” OC spacing.

F. Deck: minimum 15/32” B-C APA Rated plywood sheathing. Fasteners (Screws) used to attach the plywood deck to the joists, 2” long, No. 8 course thread screws. Screw spacing 6” OC at the plywood edges and 12” OC in the field of the plywood. Underlayment, nailed 4” at side laps. Fasteners used to attach the shingles to the plywood deck, 1-1/2” long galvanized ring shank nails spaced 8” from the butt end of the shingle and 2” from the edge of the shingle. Two nails used for each shingle. Exposure of the shingles: 7-1/2”.

G. Roof Deck: Lamarite Shingles are for application to roof decks with slopes of at least 3” per foot. For roofs having slopes of 3” per foot to 6” per foot, TAMKO self-adhering Moisture Guard Plus or TAMKO TW Metal & Tile Underlayment must be applied over the entire deck.

H. New Roof Deck: Roof decks must be smooth, dry, and free from warped surfaces. Metal drip edges should be installed at eaves and rakes.

I. Plywood: All plywood must be exterior grade as defined by the American Plywood Association. Plywood must be a minimum of 15/32” thick and applied in accordance with the recommendations of the American Plywood Association.

J. Sheathing Boards: Boards must be well seasoned, tongue and groove boards and not over 6” nominal width. Boards must be properly spaced and nailed to provide a smooth, flat surface and prevent buckling.

K. Metal Flashing: Metal valleys and flashings should be used where water is channeled off the roof or where the roof abuts a vertical wall, dormer, pipe, or chimney to help prevent leaks. Structural members that protrude through the roof should be flashed at all intersecting angles. Step flashing up the vertical surface of walls and chimneys should extend under each successive course of Lamarite Slate Shingles, and should be covered by a layer of counter flashing. Metal valleys and flashing should be a minimum of 26-gauge metal. It is important that metal flashing have the same serviceable life span as the Lamarite Shingles installed on the roof.

3.02 INSTALLATION

A. Removable Roof Section

The roof shall be supplied with a removable section for easy access in the event of pump failure. The removable section shall be reinforced to permit lifting and storing with no warpage or breaking. The removable section shall be designed to effect a rain tight seal when in place.

B. Underlayment

An underlayment must be applied over the entire deck before installation of the Lamarite Shingles. Dust, dirt, loose nails, protrusions, all old shingles, and roofing felt must be removed from the roof deck prior to application of the underlayment. Apply the underlayment only in fair weather when the air temperatures are above 35 degrees F. and the deck is dry. Align the first course of the underlayment on the lower edge of the roof, parallel to the eaves. Install successive courses from low to high point, lapping each course 3-½” over the lower course so that laps will shed water. End seams should be overlapped 6” and staggered so that end seams in one course do not align with end seams in an adjacent course.

TAMKO’s Moisture Guard Plus or TW Metal & Tile Underlayment should be applied to eaves, rakes, ridges, valleys, around chimneys, skylights or dormers, and in areas where there is potential for water to back up due to wind driven rain or ice damming.

For a UL Class A Fire Rating: Install Lamarite over either 1.) One layer of Moisture Guard Plus – TAMKO's fiberglass reinforced self-adhering SBS modified asphalt underlayment with fine mineral surfacing, or 2.) One layer of TW Metal & Tile Underlayment – TAMKO's fiberglass reinforced self-adhering SBS modified asphalt underlayment with polymeric film surfacing.

For a UL Class C Fire Rating: Install Lamarite over either 1.) One layer of TAMKO No. 30, No. 30 UL, or No. 30 ASTM organic felt underlayment, 2.) One layer of TAMKO Nail Fast SBS modified organic utility underlayment or 3.) One layer of non-perforated asphalt saturated organic felt that meets the requirements of ASTM D 226, Type II.

If left exposed, underlayment may be adversely affected by moisture and weathering. Underlayment and Lamarite Slate Shingles must be applied together.

C. Starter Course, Preformed Starter
Begin by cutting the preformed starter into two 10" x 6" pieces (discard one piece) install the remaining 10" x 6" piece so that it extends ¼" over both the rake and eave edges when using Style D metal drip edge or ¾" to 1" when using Style A metal drip edge with its short dimension parallel to the eaves' edge. Install full size 10" x 12" preformed starter across the eave maintaining the correct eave overlap, use two corrosion resistant roofing nails (3/8"head and 1-½" in length). Important: As you work along the eave, leave a ¼"space between the starter pieces.

D. Site Cut Starter
Start with one 2" x 12" starter strip. For non-gable roof planes, the outside edge strip should be cut to match the angle of the roof hip. Align and nail the 2" x 12" piece so it extends ¼" over the eave and rake edge when using Style D metal drip edge or ¾" to 1" when using Style A metal drip edge with its long dimension parallel to the eave. Fasten each piece of the starter strip with two corrosion-resistant roofing nails (3/8" head and 1-½" in length). Do not use staples. Continue installing 2" x 12" starter strips horizontally along the entire length of the eave, maintaining the correct overlap on the eave and the rake edge. Important: As you work along the eave, leave a ¼" space between each piece of starter strip to avoid buckling. Start the second starter course by positioning the 10" x 6" starter piece directly on top of the 2" x 12" strip with the bottom and rake edges aligned. Continue installing the 10" x 12" starter strips along the entire length of the eave, making sure to leave a ¼" space between pieces.

E. Shingle Application
Important: Spacer tabs are manufactured into the side edges of Lamarite Shingles to insure the proper ¼" spacing. The tabs should be clipped only from exposed edges. Do not clip the tabs between adjacent Shingles. Failure to properly space Lamarite Shingles may result in buckling and will adversely affect the appearance of the roof. Frequently check both the depth and pressure setting on pneumatic nail guns so nails are not over driven. Over-driving nails may cause Lamarite Shingles to lift and will adversely affect the appearance of the roof.

When the starter courses are complete, clip spacer tabs from the outside edge of a Lamarite Slate Shingle. In addition, for non- gable roof planes, the outside edge of Shingles along the hip must be cut to match the angle of the hip. Place the first Shingle directly on top of the starter course, aligning the edges with the bottom and rake or hip edges of the starter strip. Fasten each full Shingle with two corrosion resistant 3/8" head x 1-½" length roofing nails. Place one nail in each of the appropriate nailing locations (two nails maximum per Shingle). Continue installing Shingles across the roof, aligning the bottom of each Shingle with the bottom of the starter course.

To begin the second course of Shingles, cut one Lamarite Slate Shingles into two18" x 6" pieces. Begin the course with the 6" piece with the spacer tabs on the inside edge and the cut/sawed edge on the outside. Align the exposure marks on the side of the Shingle with the top edge of the underlying Shingle to create the proper weather exposure. Continue to install full size Lamarite Shingles across the roof. When Shingles are properly installed the exposure marks will align vertically with the tops of the Shingles below and horizontally with the exposure marks on the adjacent Shingles.

The third course of Shingles should begin in the same manner as the first, with a full size Shingle. Alternate courses using full size Shingles and 18" x 6" pieces as the first Shingle in each successive course to prevent the spaces between the Shingles in one course from aligning with the spaces in adjacent courses. When using 5", 7", and 12" sizes, alternate the size of the first Shingle in each successive course to prevent exposed nails and the keyways between Shingles in one course from aligning with keyways in previous courses. The keyways should be offset a minimum of 2".

Occassionally you will be required to cut a custom size shingle. To maintain the battered edge (chamfered) appearance, a slate cutter should be used to cut the shingles. Cut the shingles from the top down and only on the backside of the shingles. Different slate cutters will give different appearances. Consideration should be given to the slate cutter that you use. A high quality cutter will give you the most desirable edge.

Note: If chalk lines are used, do not use permanent chalk as it may adversely affect the appearance of the roof. As work progresses up roof slopes care should be taken to minimize traffic over completed areas. Dishwashing or clothing detergent may be use in combination with water and a soft bristle brush to remove mud or dirt tracked on the Shingles during construction.

F. Hip and Ridge Application
Using one of the recommended underlayment products, fasten an 8" wide cap over all hips and ridges so that one half of the cap underlayment rests on each side of the hip or ridge. Apply a double layer underlayment cap if a non SBS modified asphalt underlayment is used.

G. Preformed Hip and Ridge
Cut a 10" long piece from a Lamarite prefabricated Hip and Ridge Shingle to use as a starter Shingle. Fasten the 10" piece to the lowest point of the hip or ridge, if any, using two corrosion-

resistant roofing nails of sufficient length to penetrate ¾" into or completely through the decking. One nail should be placed in each of the appropriate nailing locations (two per Shingle). Fasten a full size Lamarite Hip and Ridge Shingle directly over and completely covering the 10" starter Shingle. Continue installing full size Hip and Ridge Shingles along the hip or ridge with the same weather exposure (7", 7-½", or 8") as the field of the roof.

H. Site-made Hip and Ridge
Construct from a Lamarite Shingle by cutting the Shingle in half to yield two 18" x 6" pieces. The two halves are applied by butting the cut edge of one half to the bottom side of the other half, and nailing in the appropriate location marked on the Shingle. The side of the Hip and Ridge Shingle with the exposed cut edge should alternate as each Hip and Ridge Shingle is fastened. Shingle spacer tabs located on the edges of the site made Hip and Ridge Shingles should be removed prior to application. Intersecting roof surfaces at hips and ridges must be properly capped to help prevent leaks. Do not walk on Hip and Ridge once it has been applied as it may cause buckling or breakage of Hip and Ridge pieces.

PART 4 – MEASUREMENT AND PAYMENT

No separate payment will be made for Composite Shingle Roofing. Payment for work in this section shall be included as part of the applicable Lump Sum or Unit Prices stated in other sections.

-END OF SECTION-

SECTION 07900 – JOINT SEALANTS

PART 1 – GENERAL

1.01 SCOPE

A. This section covers the work necessary to seal all joints that will permit penetration of dust, air, or moisture.

1.02 SUBMITTALS

A. Submit the following items in accordance with SECTION - 01330 PROJECT RECORDS AND SUBMITTALS.

1. Manufacturer's installation and surface preparation instructions.

2. Manufacturer's recommendations for joint cleaner, primer, backer rod, tooling and bond breaker.

3. Certification from sealant manufacturer the stated product being used is recommended for and best suited for joint in which it is being applied.

4. Certification stating the proposed materials meet the requirements of the Specification and referenced standards.

5. Indicate where each product is to be used.

1.03 ENVIRONMENTAL REQUIREMENTS

A. Ambient temperature shall be between 40 and 80 degrees F (4 and 27 degrees C) when sealant is applied. Consult manufacturer when sealant cannot be applied within these temperature ranges.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver material in manufacturer's original unopened container with labels intact. Labels shall indicate contents and expiration date on material.

B. Empty joint sealant containers may be disposed of onsite; however joint sealant containers and tubes with unused product may not be disposed as general debris and must be discarded as hazardous waste or taken back to Contractor's place of business for reuse.

1.05 WARRANTY

A. Sealant work shall be free from defects for a period of (3) three years from date of Final Acceptance. Contractor shall remove any defective work or material and replace them with new work and materials. The warranty shall be signed jointly by the Contractor and the sealant manufacturer.

PART 2 – MATERIALS

2.01 SEALANT MATERIALS

A. Sealants shall be uniform, homogenous, and free from lumps, skins and coarse particles when mixed. Sealants shall be non-staining and non-bleeding with a Hardness of 15 minimum and 50 maximum, as measured by ASTM C661 method. Non-sagging sealant shall be used for vertical and overhead horizontal joints and self-leveling pedestrian/traffic grade sealant shall be used for horizontal joints.

B. Sealant color shall match the color of the principal wall material adjoining the area of application.

1. **Type 1 – Immersible (Polyurethane)**
   Immersible sealant shall be capable of being continuously immersed in water and shall be a single-component, moisture curing, polyurethane based sealant conforming to ASTM C920, Type S, Grade NS, or P, Class 25. Non-sag sealant shall be Sika Chemical Corp.; Sikaflex-1a., Mameco International; Vulkem 116, or approved equal. Self-Leveling sealants shall be Sonneborn; Sonolastic SL-1, Mameco International; Vulkem 45, or approved equal.

2. **Type 2 – Sanitary Sealant (Silicone)**
   Silicone sealant shall be one-component and shall be formulated to resist mold growth and repeated exposure to high humidity while retaining adhesion, flexibility, and color. Sealant shall meet the requirements of ASTM C920, Type S, Grade NS, Class 25, Use NT, G,A, O. Sanitary sealant shall be Dow Corning; 786, General Electric; Sanitary Sealant, or approved equal.

3. **Type 3 – Fire Penetration Sealant**
   Fire penetration sealant shall be Dow Corning Corp.; Fire Stop Sealant or Foam, 3M Corp.; Fire Barrier Caulk CP25 and Putty 303, General Electric; Pensil Sealant or Foam, The Carborundum Co.; Fyre Putty, Hilti Construction Chemicals; CS240, or approved equal.

4. **Type 4 – Joint Filler (Polyurea)**
   Joint filler shall be two-component, semi-rigid material and shall conform to ACI 302.1R. Color shall be gray. Joint filler shall be Euclid Chemical Co.; EUCO QWIK joint, L & M Construction Chemical; Joint Tite 750, Sonneborn; TF-100 control joint filler, or approved equal.

5. **Type 5 –Rubber Sealant (Polysulfide)**
   Polysulfide rubber sealant shall be one or two-components and shall meet the requirements of ASTM C920. Sealant shall be Pecora; GC-5, GC-9, Sonneborn; Sonoclastic – two-part polysulfide sealant, Morton Polymer Systems; Thiokil Sealants, or approved equal.

2.02 BACKUP MATERIAL

A. Backup material shall be non-gassing, extruded, closed-cell round polyethylene foam rod, compatible with sealant used, and as recommended by sealant manufacturer. Size shall be as recommended by sealant material manufacturer. Provide for joints greater than 3/16-inch wide. Back up material shall be Haveg Industries; Minicel, Dow Corning; Ethafoam SB, Sonneborn; Sonofoam, Hercules, Inc.; HBR, or approved equal.

2.03 AUXILIARY MATERIALS

A. Bond Breaker
Bond breaker shall be pressure sensitive tape as recommended by sealant manufacturer to suit application.

B. Joint Cleaner
Joint cleaner shall be non-corrosive and non-staining, as recommended by sealant manufacturer; compatible with joint forming materials.

C. Primer
Primer shall be non-staining, as recommended by sealant manufacturer to suit application.

PART 3 – EXECUTION

3.01 GENERAL

A. Use of more than one material for the same joint is not allowed unless approved by the sealant manufacturer. Install joint sealants in accordance with ASTM C1193. Horizontal and Sloping Joints of 1-Percent Maximum Slope: Use self-leveling (Grade P) joint sealant. Steeper Sloped Joints, Vertical Joints, and Overhead Joints: Use non-sag (Grade NS) joint sealant.

3.02 PREPARATION

A. Verify that joint dimensions, and physical and environmental conditions, are acceptable to receive sealant. Surfaces to be sealed shall be clean, dry, sound, and free of dust, loose mortar, oil, and other foreign materials. Mask adjacent surfaces where necessary to maintain neat edge. Starting of work will be construed as acceptance of subsurfaces. Apply primer to dry surfaces as recommended by sealant manufacturer. Verify that joint shaping materials and release tapes are compatible with sealant. Examine joint dimensions and size materials

to achieve required width/depth ratios. Carefully follow manufacturer's instructions for mixing multi-component products.

3.03 INSTALLATION

A. Use joint filler to achieve required joint depths, to allow sealants to perform intended function. Install backup material as recommended by sealant manufacturer. Where possible, provide full-length sections without splices; minimize number of splices. Tape sealant may be used as joint filler if approved by sealant manufacturer. Use bond breaker where recommended by sealant manufacturer.

B. Seal joints around window, door and louver frames, expansion joints, and elsewhere as indicated. Where piping, conduit, ductwork, etc. penetrate wall, seal each side of wall opening. Follow manufacturer's recommendation and instructions, filling joint completely from back to top, without voids. Tool slightly concave after sealant is installed and leave sealant with an even neat finish. When tooling white or light color sealant, use a water-wet tool. Finish joints free of air pockets, foreign embedded matter, ridges, and sags. Make all joints water and airtight.

3.04 CLEANING

A. Clean surfaces next to the sealed joints of smears or other soiling resulting from sealing application. Replace damaged surfaces resulting from joint sealing or cleaning activities.

3.05 JOINT SEALANT SCHEDULE

A. Type 1 – Polyurethane
Use Type 1 immersible polyurethane for the interior and exterior building joints and elsewhere as indicated on the Drawings.

B. Type 2 – Silicone
Use Type 2 silicone sanitary sealant for joints between backsplashes, lab sinks, and around plumbing fixtures where they fit against walls and floors.

C. Type 3 – Fire Rated
Use sealant Type 3 to seal voids and holes around penetrations through fire rated elements.

D. Type 4 – Polyurea
Use polyurea joint filler for filling interior control joints, sawcut, and construction joints in concrete floors.

E. Type 5 – Polysulfide
Use Type 5 polysulfide for filling joints in the chemical rooms where sealant is exposed to concentrated chlorine gas or liquid.

PART 4 – MEASUREMENT AND PAYMENT

No separate payment will be made for Joint Sealants. Payment for work in this section shall be included as part of the applicable Lump Sum or Unit Prices stated in other sections.

-END OF SECTION-

SECTION 08110 - METAL DOORS AND FRAMES

Bid Item No. 13

PART 1 - GENERAL

1.01 SCOPE

A. This section covers the work necessary to furnish and install steel doors and steel door frames as shown on the Drawings and as specified herein including standard steel frames for doors and windows and fire rated frames. See SECTION 08710 - FINISH HARDWARE, SECTION 10050 – BUILDING and SECTION 09900 - PAINTING for additional requirements.

1.02 QUALITY ASSURANCE

A. Provide doors and frames complying with Steel Door Institute "Recommended Specifications for Standard Steel Doors and Frames" (SDI-100), and as herein specified.

1. **Fire-Rated Door Assemblies**
   Where fire-rated doors assemblies are indicated or required, provide fire-rated door and frame assemblies that comply with NFPA 80 "Standard for Fire Doors and Windows," and have been tested, listed and labeled in accordance with ASTM E152 "Standard Methods of Fire Tests of Door Assemblies" by a nationally recognized independent testing and inspection agency acceptable to authorities having jurisdiction.

   At stairwell enclosures, provide doors which have Temperature Rise Rating of 450 degrees F. (232 degrees C) maximum in 30 minutes of fire exposure.

2. **ADA Requirements**
   Comply with pertinent requirements of the Americans with Disabilities Act (ADA) and Title 24 of the California Administrative Code.

1.03 SUBMITTALS

A. Product Data
Submit manufacturer’s technical product data substantiating that products comply with requirements.

B. Shop Drawings
Submit for fabrication and installation of steel doors and frames:

1. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections.

2. Show anchorage and accessory items.

C. Fire Rated Doors - Exceeding Labeled Limitations

For door assemblies required to be fire-rated, and exceeding limitations of labeled assemblies, submit manufacturer's certification that each door and frame assembly has been constructed to conform to design, materials, and construction equivalent to requirements for labeled construction.

D. Fire Rated Doors - Exceeding Size Limitations

For door assemblies required to be fire-rated, and exceeding sizes of tested assemblies, submit manufacturer's certification that each door and frame assembly has been constructed to conform to design, materials and construction equivalent to requirements for labeled construction.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work in cartons or crates providing protection during transit and job storage. Provide additional sealed plastic wrapping for factory-finished doors. Inspect metal work upon delivery for damage. Minor damages may be repaired, provided refinished items are equal in all respects to new work and acceptable to Engineer. Otherwise, remove and replace damaged items as directed.

B. Store doors and frames at building site under cover. Place units on minimum 4" high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create a humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4" spaces between stacked doors to promote air circulation.

PART 2 - MATERIALS

2.01 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering steel doors and frames which may be incorporated in the work include; but are not limited to, the following:

1. Curries of ASSA ABLOY Door Security Solutions
2. Ceco Door of ASSA ABLOY Door Security Solutions
3. Steelcraft of Ingersoll Rand Co.
4. Amweld International

2.02 GENERAL MATERIALS

A. Hot-Rolled Steel Sheets and Strip

Provide commercial quality carbon steel, pickled and oiled, complying with ASTM A569 and ASTM A568.

B. Cold-Rolled Steel Sheets
Provide commercial quality carbon steel, complying with ASTM A366 and ASTM A568.

C. Galvanized Steel Sheets
Provide zinc-coated carbon steel sheets of commercial quality, complying with ASTM A526, with ASTM A525, G60 zinc coating, mill phosphatized.

D. Stiffeners, Reinforcement, Edge Channels, and Moldings
Fabricate concealed stiffeners, reinforcement, edge channels, and moldings from either cold-rolled or hot-rolled steel (at fabricator's option); steel gage shall be not less than 16-gauge.

E. Supports and Anchors
Fabricate of not less than 18-gauge galvanized sheet steel.

F. Inserts, Bolts, and Fasteners
Provide manufacturer's standard units, except that hot-dipped galvanized items, to be built into exterior walls, shall comply with ASTM A153, Class C or D as applicable.

G. Finish Hardware
The Contractor shall furnish and install all finish hardware as indicated on the Drawings or in these specifications, including but not necessarily limited to, the hardware listed herein. Hardware shall be furnished complete, including all parts necessary for satisfactory operation. All locking hardware shall be keyed to the City's standard. Screws and bolts of proper size and design shall be furnished. In the event the Contractor proposes to furnish equivalent hardware in lieu of any of the items listed, the Contractor's schedule shall show the manufacturer's name and catalog number of each item. A complete hardware list shall be submitted to the Engineer for approval. See SECTION 08710 - FINISH HARDWARE for additional requirements.

H. Shop Primer
Provide rust-inhibitive enamel or paint, by either air-drying or baking, suitable as a base for specified finish paints.

I. Mineral Cores
Mineral cores, if used, shall contain no asbestos.

J. Corridor Windows
Corridor windows, where required shall provide fire-rated frames of the style and arrangements shown on the contract drawings.

K. Glazing

1. **At Non-Labeled Doors:**
   Tempered float glass, ASTM C1048, Kind FT, Condition A, Type I, Glass 1 clear glass, Glazing Quality B, meeting ANSI Z97.1 and 16 CFR 1201, CI or CII as applicable; 6-

mm minimum thickness.

2. **At Labeled Doors:**
   Wire glass, ASTM C1036, Type II, Class 1, Form 1, glazing quality, clear float, UL listed, meeting ANSI Z97.1 with 0.020 inch diameter wire welded in square mesh pattern embedded in 6-mm minimum thickness.

2.03 HOLLOW STEEL DOORS

A. Hollow steel doors shall be manufactured from either cold-rolled or hot-rolled steel (at fabricator's option). All exterior facing doors shall be filled with insulation. For openings of less than 4'-0" in width, hollow steel doors shall be manufactured of not less than 18-gauge steel. Hollow steel doors for openings of 4'-0" and greater in width shall be steel stiffened and manufactured of not less than No.16-gauge steel. Doors shall be 1 ¾ inches thick and shall be louvered as shown on the Drawings. Doors larger than 3 feet wide shall be constructed as shown on the Drawings.

2.04 STANDARD STEEL FRAMES

A. Metal Frames

Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, of types and styles as shown on the Drawings.

1. Conceal fastenings, unless otherwise indicated.

2. Fabricate interior frames of minimum 16-gauge cold-rolled furniture steel.

3. Fabricate exterior frames of 16-gauge hot-dipped galvanized steel.

4. Fabricate frames with mitered and fully welded corners (knock-down frames are not acceptable).

5. Steel door frames shall be the set-in type for eight inch (8") block.

6. Steel door frames shall be of the same manufacturer as the door.

B. Door Silencers

1. Except on gasketted and rated frames, drill stops to receive three silencers on strike jambs of single-swing frames and two silencers on heads of double-swing frames.

2. Provide plastic plugs to keep holes clear during construction.

C. Plaster Guards and Mortar Boxes

Provide 26-gauge steel plaster guards or mortar boxes, welded to frame, at back of finish

hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.

D. Junction Box

Provide a junction box or enclosure behind each item of electrical hardware and connection conduit between junction boxes on the same frame.

2.05 LOUVERS

A. Removable insect screens shall be installed on the inside face of all louvers and shall be 0.063 x 1/4-inch aluminum screen set in a fixed aluminum U-frame. Drilling for hardware shall be from templates.

1. Acoustical Louvers

Frames shall be a minimum of 12-inches in depth manufactured of a minimum of 18-gauge, galvanized steel material. Blades shall be a minimum 18-gauge, galvanized steel material backed by fiberglass fill insulation. Perforated galvanized 22-gauge steel retaining material shall be installed behind insulation. Insulated blades shall be positioned in frames at a 45 degree angle on 9-inch blade centers. Louvers shall be model MFLA-12-36 as manufactured by Metal Form Manufacturing Co. Inc. or approved equal.

2.06 STOPS AND MOLDINGS

A. Provide stops and moldings around solid, glazed, and louvered panels in hollow metal units and in frames to receive doors, where indicated. Form fixed stops and moldings integral with frame, unless otherwise indicated.

B. Provide removable stops and moldings where indicated or required, formed of not less than 20-gauge steel sheets matching steel of frames.

1. Secure with countersunk machine screws spaced uniformly not more than 12" on center.

2. Form corners with butted hairline joints

3. Coordinate width of rabbet between fixed and removable stoops with type of glass or panel and type of installation indicated.

2.07 FACTORY FINISHING REQUIREMENTS

A. Galvanized with A60 zinc coating in accordance with ASTM A653 (Wipe Coat galvanized coating is not acceptable).

B. Phosphate treat metal for paint adhesion.

C. Shop coat of electrostatically applied, 1.0 mil minimum, baked-on enamel in custom color as selected by City.

2.08 MISCELLANEOUS ITEMS

A. Furnish manufacturer's standard core filler, fasteners, and other ancillary items.

PART 3 - EXECUTION

3.01 FABRICATION, GENERAL

A. Fabricate steel frame units to be rigid, neat in appearance and free from defects, warp or buckle; comply with SDI-100 requirements as indicated. Unless otherwise indicated, provide counter-sunk flat Phillips heads for exposed screws and bolts.

B. Prepare frames to receive mortised and concealed finish hardware in accordance with final Finish Hardware Schedule and templates provided by hardware supplier. Comply with the applicable requirements of ANSI A115 series specifications for door and frame preparation for hardware. For concealed overhead door closers, provide space, cutouts, reinforcing and provisions for fastening in top rail of doors or head of frames, as applicable. Reinforce frames to receive surface-applied hardware; drilling and tapping for surface-applied finish hardware may be done at the job site. Locate finish hardware as shown on final Shop Drawings or, if not indicated, in accordance with pertinent provisions of these specifications.

C. Clean, treat, and paint exposed surfaces of steel door and frame units, including galvanized surfaces. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before application of paint. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint.

3.02 INSTALLATION

A. Install standard steel doors, frames, and accessories in accordance with final Shop Drawings, manufacturer's data, and as herein specified. Doors and frames shall be accurately cut, fitted, and installed level, square, plumb, and in alignment. Fasteners shall be of sufficient length, and shall be sized for loads imposed. Doors and frames shall be provided with accurately made cutouts, and shall be reinforced for strength where necessary. Doors shall be adjusted to provide smooth, unbinding operation with all hardware fully operable.

1. Comply with provisions of SDI-105 "Recommended Erection Instructions For Steel Frames," unless otherwise indicated.

2. Install fire-rated frames in accordance with NFPA Std. No. 80.

3. In metal stud partitions, install at least three (3) wall anchors per jamb at hinge and strike levels.

4. In open steel stud partitions, place studs in wall anchor notches and wire tie.

5. In closed steel stud partitions, attach wall anchors to studs with tapping screws.

3.03 ADJUST AND CLEAN

A. Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer. Immediately prior to final inspection, remove protective plastic wrappings from pre-finished doors. Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

3.04 PROTECTION

A. Protect installed doors and frames against damage from other construction work. Minor scratches shall be touched up with matching aerosol paint. Major dents and damage may be cause for replacement at the discretion of the Engineer.

PART 4 – MEASUREMENT AND PAYMENT

All work as specified herein, satisfactorily completed, shall be paid for on a Lump Sum basis as stated in **Bid Item Schedule** for the item listed below:

Bid Item No. 13 – METAL FRAMES AND DOORS

-END OF SECTION-

SECTION 08710 - FINISH HARDWARE

PART 1 - GENERAL

1.01 SCOPE

A. This Section covers the work necessary to furnish and install all door hardware components that are required for swing doors. The Contractor shall furnish all labor and materials needed to complete the work included in this section, complete.

B. It shall be the specific duty and responsibility of the Contractor to examine the Contract Documents and furnish proper hardware for all openings, whether scheduled or not. Furnish such hardware in type and quality suitable for the service required and comparable to those specified for similar conditions.

1.02 SUBMITTALS

A. Product Data

Submit manufacturer's technical product data for each item of hardware in accordance with SECTION 01330 - PROJECT RECORDS AND SUBMITTALS and as described herein. Include whatever information may be necessary to show compliance with requirements, and include instructions for installation and for maintenance of operating parts and finish. Coordinate hardware with doors, frames and related work to ensure proper size, thickness, hand, function and finish of hardware. Include the following information in the submittals:

1. Type, style, function, size and finish of each hardware item;
2. Name and manufacturer of each item;
3. Fastenings and other pertinent information;
4. Mounting locations for hardware;
5. Door and frame sizes and materials;
6. Keying information;
7. Clearly indicate how the City's instructions on keying of locks are to be fulfilled.

B. Samples

Prior to submittal of the final hardware schedule and prior to final ordering of finish hardware, submit one sample of each type of exposed hardware unit, finished as required, and tagged with full description for coordination with schedule. All samples will be returned to the supplier. Units that are acceptable and remain undamaged through submittal, review, and field comparison procedures may, after final check of operation, be used in the Work, within limitations of keying coordination requirements.

C. Templates

Furnish hardware templates to each fabricator of doors, frames, and other items to be factory-prepared, for the installation of hardware. Upon request, check Shop Drawings of such other

items to confirm that adequate provisions are made for proper location and installation of hardware.

1.03 QUALITY ASSURANCE

A. Manufacturer

Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer.

B. Supplier Qualifications

The door hardware supplier shall be a recognized architectural door hardware supplier, with warehousing facilities in the vicinity of the Work, that has a record of successful service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Work.

The supplier shall meet with City's locksmith coordinator to finalize keying requirements and to obtain final instructions in writing.

Finish hardware supplied for this Work shall comply with all applicable codes, including provisions for accessibility by the physically handicapped required by the California Code of Regulations, Title 24, Part 2 and the Americans with Disabilities Act (ADA).

C. Fire-Rated Openings

Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction.

Provide only items of door hardware that are listed and are identical to products tested by UL, Warnock Hersey, FM, or other testing and inspecting organization acceptable to authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.

Where emergency exit devices are required on fire-rated doors (with supplementary marking on doors' UL or FM labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL or FM label on exit devices indicating "Fire Exit Hardware."

1.04 PRODUCT HANDLING

A. Provide secure lock-up for hardware delivered to the Work but not yet installed. Control handling and installation of hardware items that are not immediately replaceable, so that completion of the Work will not be delayed by hardware losses, both before and after installation.

1.05 MAINTENANCE

A. Furnish a complete set of specialized tools and maintenance instructions as needed for City's

continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - MATERIALS

2.01 ACCEPTABLE MANUFACTURERS

A. Hinges
Hager, Ives, McKinney, Stanley, or equal

B. Locksets/Latchsets
Schlage "L" Series, 03 Levers, or equal

C. Wall, Floor and Overhead Stops and Holders
Ives, Hager, Quality, Glynn Johnson or equal

D. Exit Devices
Von Duprin or equal

E. Protection Plates
Hager, Ives, McKinney or equal

F. Automatic Flush Bolts
Hager, Ives, or equal

G. Coordinators
Hager, Ives, or equal

H. Closers
Hager, LCN, or equal

I. Thresholds, Gaskets, Weatherstripping, and Astrogals
Pemko, National Guard or equal

2.02 FABRICATION

A. The Drawings show direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

B. Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for the applicable hardware units by applicable ANSI A156 series standard for each type hardware item and with ANSI A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.

C. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws, except as specifically indicated. Doors specified require reinforcement for UL approved screw attachment of all hardware items to fire rated doors. Thru-bolting will not be acceptable and will be cause for rejection of doors.

D. Provide concealed fasteners for hardware units which are exposed when door is closed, except when no standard units of the type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on the opposite face is exposed in other work, except where it is not feasible to adequately reinforce the item. In such cases, provide sleeves for each thru-bolt or use hex screw fasteners.

2.03 HINGES

A. Continuous Hinges

Provide only full mortise pin and barrel units. Furnish Phillips flat-head or machine screws for installation of units. Finish screw heads to match surface of hinges. Hinges shall be stainless steel conforming to ANSI 156.26 with ANSI 630 / US32D finish with nylon bearings between each barrel/knukle. Full mortise continuous hinges shall be Hager 790-900, Ives 700, Stanley 651, McKinney MCK-FM300, or approved equal.

2.04 LOCKSETS AND LATCHSETS

A. Contractor shall provide and install locksets and latchsets. Locksets shall be stainless steel mortise locks with levers and escutcheon trim. Contractor shall furnish and install all cylinders. Keys will be provided and keyed by the Contractor in conformance with the City's standards for quantity and type of key.

1. Exterior Lockset

Lockset for entrance/access doors shall be Schlage L9465P, 03L trim, 630 finish, or approved equal.

2. Interior Lockset

Locksets for doors within the pump station building shall be Schlage L9010, 03L trim, 630 finish, or approved equal.

2.05 WALL, FLOOR AND OVERHEAD STOPS AND HOLDERS

A. Wall Stop/Holder

Furnish and install cast brass wall stops Ives WS445, Hager 256, or approved equal, wall stop and holder wherever door strikes wall.

B. Floor Stop/Holder

Where wall stops will not work, furnish and install cast brass Ives FS446, Hager 268, or approved equal, floor stop and holder.

C. Overhead Stop/Holder

Where wall or floor stops will not work, provide satin stainless steel Glynn Johnson heavy duty overhead door holder/stop, 90 Series, Hold-Open Model, US32D for doors 3 feet and less in width and use 79 Series, US32D for doors wider than 3 feet, or approved equal.

2.06 EXIT DEVICES

A. Exit devices (panic bars) shall be stainless steel, non-handed, field sizeable, devices for single or double doors and shall coordinate and comply with the lockset/latchsets specified above. Exit devices shall be UL listed Panic Hardware (FVSR) SA163 (N). Fire devices (F) shall be UL listed Fire Exit Hardware (GXHX) R4504 (N), A label. Exit devices shall be tested in accordance to ANSI A156.3, 1989, Grade 1. Panic bars shall be Von Duprin Series 98 Exit Devices, with US32D finish, or approved equal.

2.07 PROTECTION PLATES

A. Protection plates shall be of the kickplate type and shall be installed on all doors. Kickplates shall be constructed from a minimum of 0.050" stainless steel. Gasket tape shall be used as necessary to reduce tarnishing from electrolytic oxidation. Kickplates shall be Hager 193S, Ives Series 8400, McKinney KP-50, or approved equal.

2.08 AUTOMATIC FLUSH BOLTS

A. Flush bolts for metal doors shall be stainless steel, non-handed and shall combine a constant latching top bolt with an automatic bottom bolt. Flush bolts shall be Hager 293D, Ives FB51P, or approved equal.

2.09 COORDINATORS

A. All paired doors shall have door coordinators which will prevent the active door from closing before the inactive door, by means of a lever and trigger mechanism. Coordinator channel shall be constructed of steel with a paintable prime coat finish, length variable per door opening. Coordinator shall have a safety mechanism which will allow the active door to close first, if under extreme pressure. Coordinators shall be Hager 297D, Ives COR X FL, or approved equal.

2.10 CLOSERS

A. Door closers used for exterior doors up to 4 foot 0 inches and interior doors up to 5 foot 0 inches shall conform to ANSI A156.4, be heavy duty, surface mounted, manufactured of heavy duty cast iron, with an aluminum colored powder coat finish. Closer shall be non handed, non-sized, meet ADA requirements, have a hold-open arm function, and have a non-metallic cover. Door closers shall be Hager Series 5300, Grade 1, with aluminum painted finish, LCN Series 4040, Grade 1, with aluminum powder coated finish, or approved equal.

2.11 THRESHOLDS, GASKETS, WEATHERSTRIPPING, AND ASTRAGALS

A. Thresholds shall be smooth saddle type, manufactured of stainless steel and shall be National Guard Products 412SS, Pemko 175SS, or approved equal. Gaskets shall be self-adhesive silicone National Guard Products 5050W, Pemko S88W or approved equal smoke seal gaskets and National Guard Products 9450W or 5050W, Pemko HSS2000, or approved equal fire seal gaskets. Weatherstripping shall be the rigid jamb type with an extruded silicone rubber seal and shall be National Guard Products 162SA, Pemko 303AS, or approved equal. Overlapping astragals shall be installed on pairs of doors to conceal the gap between the doors. Astragals shall be manufactured of stainless steel and shall be fastened with through-bolts. Astragals shall be National Guard Products 139 SS, Pemko 357SS, or approved equal.

2.12 HARDWARE FINISHES

A. Provide matching finishes for hardware units at each door or opening, to the greatest extent possible, except as otherwise indicated. All finishes shall meet or exceed the ANSI A156.18 Standard for Materials and Finishes. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness and other qualities complying with manufacturer's standards, but in no case less than specified for the applicable units of hardware by referenced standards.

PART 3 – EXECUTION

3.01 HARDWARE SCHEDULE

Door Description	Hardware System #	Handing
North Doors (Chemical Room)	2	Left & Right
Interior Door	1	Right
West Doors (Pump Station Room)	4	Left & Right
East Doors (Pump Station Room)	4	Left & Right
South Door (Pump Station Room)	3	Right

A. SYSTEM #1 (SINGLE DOOR WITH PANIC HARDWARE)

#		Hardware	Model/Catalog #	Finish	Manufacturer
	Ea	Continuous Hinge	790-900	US32D/ANSI 630	Hager
	Ea	Continuous Hinge	700	US32D/ANSI 630	Ives
	Ea	Continuous Hinge	651	US32D/ANSI 630	Stanley
	Ea	Continuous Hinge	MCK-FM300	US32D/ANSI 630	McKinney
1	Ea	Exit Device	98NL X 990NL	ANSI 630	Von Duprin
1	Ea	Rim Cylinder	20-057	ANSI 626	Schlage

1	Ea	Surface Closer	4041 EDA	ANSI 689	LCN
1	Ea	Stop & Holder	WS445 / FS446	ANSI 626	Ives
1	Set	Weather-Stripping	5050W	WHT	National Guard
1	Set	Weather-Stripping	162SA	CLR	National Guard
1	Ea	Door Bottom	35VA	ANSI 628	National Guard
1	Ea	Threshold	412SS	AL	National Guard
1	Ea	Threshold	175SS	AL	Pemko
1	Ea	Kickplate	193S	SS	Hager
1	Ea	Kickplate	8400	SS	Ives
1	Ea	Kickplate	KP-50	SS	McKinney

B. SYSTEM #2 (PAIR OF DOORS WITH PANIC HARDWARE)

The left door shall be the keyed access door.

#		Hardware	Model/Catalog #	Finish	Manufacturer
	Ea	Continuous Hinge	790-900	US32D/ANSI 630	Hager
	Ea	Continuous Hinge	700	US32D/ANSI 630	Ives
	Ea	Continuous Hinge	651	US32D/ANSI 630	Stanley
	Ea	Continuous Hinge	MCK-FM300	US32D/ANSI 630	McKinney
1	Ea	Key Remov. Mullion	KR4954 X 154 STABILIZER	SP28	Von Duprin
1	Ea	Mullion Storage Kit	MT54	SP28	Von Duprin
1	Ea	Exit Device	98NL X 990NL	630	Von Duprin
1	Ea	Exit Device	98DT X 990DT	630	Von Duprin
1	Ea	Rim Cylinder	20-057	626	Schlage
1	Ea	Mortise Cylinder	20-001 X 1-1/4" (MULLION)	626	Schlage
1	Ea	Mullion Seal	5100	BLK	National Guard
2	Ea	Surface Closer	4041 EDA	689	LCN
2	Ea	Stop & Holder	WS445 / FS446	626	Ives
1	Set	Weather-Stripping	5050W	WHT	National Guard
1	Set	Weather-Stripping	162SA	CLR	National Guard
2	Ea	Door Bottom	35VA	628	National Guard
1	Ea	Threshold	412SSS	AL	National Guard
1	Ea	Threshold	175SS	AL	Pemko
1	Ea	Kickplate	193S	SS	Hager
1	Ea	Kickplate	8400	SS	Ives
1	Ea	Kickplate	KP-50	SS	McKinney

C. SYSTEM #3 (SINGLE DOOR WITH LOCKSET)

#		Hardware	Model/Catalog #	Finish	Manufacturer
	Ea	Continuous Hinge	790-900	US32D/ANSI 630	Hager
	Ea	Continuous Hinge	700	US32D/ANSI 630	Ives
	Ea	Continuous Hinge	651	US32D/ANSI 630	Stanley
	Ea	Continuous Hinge	MCK-FM300	US32D/ANSI 630	McKinney
1	Ea	Lockset	L9453P 03L	630	Schlage
1	Ea	Surface Closer	4041 EDA	689	LCN
1	Ea	Stop & Holder	WS445 / FS446	626	Ives
1	Set	Weather-Stripping	5050W	WHT	National Guard
1	Set	Weather-Stripping	162SA	CLR	National Guard
1	Ea	Door Bottom	35VA	628	National Guard
1	Ea	Threshold	412SS	AL	National Guard
1	Ea	Threshold	175SS	AL	Pemko
1	Ea	Kickplate	193S	SS	Hager
1	Ea	Kickplate	8400	SS	Ives
1	Ea	Kickplate	KP-50	SS	McKinney

D. SYSTEM #4 (PAIR OF DOORS WITH LOCKSET)

The East Doors (Pump Station Room) shall be provided without exterior handles.

#		Hardware	Model/Catalog #	Finish	Manufacturer
	Ea	Continuous Hinge	790-900	US32D/ANSI 630	Hager
	Ea	Continuous Hinge	700	US32D/ANSI 630	Ives
	Ea	Continuous Hinge	651	US32D/ANSI 630	Stanley
	Ea	Continuous Hinge	MCK-FM300	US32D/ANSI 630	McKinney
1	Set	Constant Latch Bolts	FB51P	630	Ives
1	Ea	Dust Proof Strike	DP1	626	Ives
1	Ea	Lockset	L9453P 03L	630	Schlage
1	Ea	Astragal	139SS	630	National Guard
1	Ea	Astragal	357SS	630	Pemko
1	Ea	Coordinator	COR X FL	628	Ives
2	Ea	Closer Mtg Brackets	MB1/2	600	Ives
2	Ea	Surface Closer	4041 EDA	689	LCN
2	Ea	Stop & Holder	WS445 / FS446	626	Ives
1	Set	Weather-Stripping	5050W	WHT	National Guard
1	Set	Weather-Stripping	162SA	CLR	National Guard
2	Ea	Door Bottom	35VA	628	National Guard
1	Ea	Threshold	412SSS	AL	National Guard
1	Ea	Threshold	175SS	AL	Pemko
1	Ea	Kickplate	193S	SS	Hager
1	Ea	Kickplate	8400	SS	Ives
1	Ea	Kickplate	KP-50	SS	McKinney

3.02 INSTALLATION

A. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage, and reinstallation, or application of surface protections, with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrate.

B. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation. Drill and countersink units that are not factory-prepared for anchorage fasteners; space fasteners and anchors in accordance with industry standards. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant.

3.03 ADJUST AND CLEAN

A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly as intended for the application made. Clean adjacent surfaces soiled by hardware installation.

3.04 MAINTENANCE SERVICE

A. Approximately six (6) months after filing of the Notice of Completion for the project by the City, the Contractor shall replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units at no additional cost to the City.

PART 4 – MEASUREMENT AND PAYMENT

No separate payment will be made for Finish Hardware. Payment for work in this section shall be included as part of the applicable Lump Sum or Unit Prices stated in other sections.

-END OF SECTION-

SECTION 09900 – PAINTING

Bid Item No. 14

PART 1 – GENERAL

1.01 SCOPE

A. This section includes everything necessary for, or incidental to, executing and completing the painting and coating of all above ground station piping, well pump motor and discharge head, except as otherwise hereinafter specifically excluded, complete.

B. All necessary ventilation, lighting equipment, and scaffolding shall be furnished and installed by the Contractor. Such scaffolding shall conform to regulations of the State Industrial Accident Commission and local ordinances.

1.02 SUBMITTALS

A. The Contractor shall submit the following items to the Engineer for review and color selection:

1. **Color Cards**
   Submit Color cards for all coatings proposed for use showing full range of standard colors.

2. **Product Data**
   Submit product data including generic description, complete technical data, surface preparation and application instructions.

3. **Coating System Data Sheets**
   Submit Coating System Data Sheets. A sample is included at the end of this Section.

4. **Manufacturer's Certification**
   Submit the manufacturer's certification that coatings comply with specified requirements and are suitable for intended application.

5. **Warranty**
   Submit the manufacturer's standard warranty.

1.03 SURFACES REQUIRING PAINTING

A. All exposed pump components including the motor, discharge head, and base plate, above ground piping, including valves and fittings shall be painted including the following items:

PAINTING SCHEDULE

Indoor Coatings	System #	Color
Walls	12	To be determined by Owner
Doors	5	To be determined by Owner
Ceiling	13	To be determined by Owner
FELC Station Piping	24, 25, 4	To be determined by Owner
Station Piping	3	To be determined by Owner
Discharge Head, Motor, Baseplate, etc.	3	To be determined by Owner
PVC Conduit	17	To be determined by Owner
EMT Conduit	3	To be determined by Owner
Wood	22	To be determined by Owner
Floor (Excluding Chemical Room)	15	To be determined by Owner
Floor (Chemical Room)	14	To be determined by Owner
Chemical Room Vent Stack	15	To be determined by Owner
Copper (Excluding Chemical Room)	19	To be determined by Owner
Copper (Chemical Room)	15	To be determined by Owner
Chemical Room Sumps	15	To be determined by Owner

Outdoor Coatings	System #	Color
Walls	10	To be determined by Owner
Doors	5	To be determined by Owner
FELC Station Piping	24, 25, 4	To be determined by Owner
Station Piping	3	To be determined by Owner
PVC Conduit	16	To be determined by Owner
EMT Conduit	3	To be determined by Owner
Downspouts, louvers, vents	18	To be determined by Owner
Trim, fascia, eaves	21	To be determined by Owner
PVC Conduit	16	To be determined by Owner
EMT Conduit	3	To be determined by Owner
Copper (Excluding Chemical Room)	18	To be determined by Owner

1.04 SURFACES NOT REQUIRING PAINTING

A. Manufacturer coated equipment such as the motor control center, telemetry, pneumatic

components, roofing, machined surfaces, cement mortar lined and coated pipe, grease fittings, glass, equipment nameplates, aluminum and stainless steel components except as required for electrical insulation between dissimilar metals or where aluminum and stainless steel are in contact with concrete.

1.05 QUALITY ASSURANCE

A. Single Source

All materials of a paint system, including primer and finish coats, shall be produced by the same paint manufacturer unless otherwise approved by the Engineer. Thinners, cleaners, driers, and other additives shall be as recommended by the paint manufacturer of the particular coating.

B. Manufacturer Representative

The paint manufacturer shall provide a representative to visit the job site at intervals during surface preparation and painting as may be required for product application questions and to determine compliance with the manufacturer's instructions as may be required for product application quality assurance. A manufacturer representative's visit may be necessary to resolve field problems attributable to, or associated with, the manufacturer's products furnished under this contract.

C. Surface Preparation

Preparation of surfaces and application of coatings shall be in conformance with the applicable AWWA, SSPC, and ASTM specifications, this Specification, and the printed recommendations of the paint manufacturer. All surfaces must be dry, clean, free of oil, grease, form release agents, curing compounds, laitance, other foreign matter and be structurally sound. Remove all loose paint, mortar spatter, mill scale, and rust.

D. Weather

Prepare surfaces and apply and cure coatings within air and surface temperature range in accordance with the manufacturer's instructions foremost. Abrasive blast cleaning shall not be performed whenever the relative humidity exceeds 85-percent, nor whenever the surface temperature is less than 5-degrees F above the dew point of the ambient air. The surface temperature shall be a minimum of 40-degrees F and at least 5-degrees above the dew point before coating can occur for all coating systems. Do not prepare surfaces or apply coatings in dust, smoke, rain, fog, or damp or humid weather or if the wind velocity is above the manufacturer's limit. Schedule coating work to avoid release of excessive dust and airborne contaminants.

E. Ventilation

Provide ventilation during coating evaporation stage in confined or enclosed areas.

F. Inspection

The Contractor shall give the Engineer a minimum of 3-days advance notice of the start of any surface preparation work or coating application work. All such work shall be performed

only in the presence of the Engineer, unless the Engineer has granted prior approval to perform such work in his absence.

Inspection by the Engineer, or the waiver of inspection of any particular portion of the work, shall not be construed to relieve the Contractor of his responsibility to perform the work in accordance with these Specifications.

For all coatings subject to immersion, full cure must be obtained for the completed system prior to submersion. Consult the coatings manufacturers written instructions for these requirements. The coating shall not be immersed for any purpose until completion of the curing cycle.

PART 2 – MATERIALS

2.01 GENERAL

A. All materials used, except as otherwise specified in carrying out the provisions of this contract, shall be manufactured by the following companies, or approved equals:

1. Devoe Coatings
2. TNEMEC
3. Rain Guard
4. Glidden Professional
5. Kelly Moore

B. Alternate systems will be considered subject to the review of the Engineer. Deviations from the specified paint systems must be reviewed by the Engineer prior to use. Certification with NSF Standard 61 shall be provided by the National Sanitation Foundation for all coating system materials used in contact with the production, treatment or distribution of drinking water including contact with raw water to be treated. Use only products that are in compliance with local VOC regulations.

2.02 PAINT MATERIALS

The following surface preparations and paint and coating materials shall apply to this project:

A. System Number 3 – (Indoor/Outdoor Coating) Exterior of Station Piping, Valves, Fittings, Pump Discharge Heads, Pump Motors, and Pump Base Plates.

All exposed steel surfaces exposed to weather or are located above grade inside a building shall be coated as follows:

1. **Surface Preparation**
   Commercial Blast (SSPC 6)

2. **First Coat**
   Aromatic Urethane, Zinc-Rich or Reinforced Inorganic Zinc Urethane

a. TNEMEC Series 90-97 Tneme-Zinc @ 2.5 to 3.5 mils DFT
OR
b. Devoe Catha-Coat 302H @ 2.5 to 4.0 mils DFT

3. Second Coat
Polyamidoamine Epoxy or High Solids Epoxy

a. TNEMEC Series V69F Hi-Build Epoxoline @ 4 to 6 mils DFT
OR
b. Devoe Bar-Rust 235V (In Winter) or Bar-Rust 231 (In Summer) @ 4 to 6 mils DFT

4. Third Coat
Aliphatic Acrylic Polyurethane

a. TNEMEC Series 1075 Endura-Shield II @ 3 to 5 mils DFT
OR
b. Devoe Devthane 379H @ 2 to 3 mils DFT

B. System Number 4 – (Indoor/Outdoor Coating) Exterior of Epoxy Coated Steel Piping, Valves, Fittings, Pump Discharge Heads, Pump Motors, and Pump Base Plates.
All steel piping with existing fusion bonded epoxy coating including valves, fittings, pump discharge heads, pump motors, and pump base plates that are exposed to weather or are located above grade inside a pump station building shall be coated as follows:

1. Surface Preparation
Hand Tool Clean (SSPC 2,3) Abrade and De-Gloss existing surface.

2. First Coat
Polyamidoamine Epoxy or High Solids Epoxy

a. TNEMEC Series V69F Hi-Build Epoxoline @ 4 to 6 mils DFT
OR
b. Devoe Bar-Rust 235V (In Winter) or Bar-Rust 231 (In Summer) @ 4 to 6 mils DFT

3. Second Coat
Aliphatic Acrylic Polyurethane

a. TNEMEC Series 1075 Endura-Shield II @ 3 to 5 mils DFT
OR
b. Devoe Devthane 379H @ 2 to 3 mils DFT

C. System Number 5 – (Indoor/Outdoor Coating) Exterior of Factory Primed Steel Doors, Frames and Miscellaneous Equipment
All exterior and interior factory primed steel doors, frames and miscellaneous equipment that

are exposed to weather or are located inside a building shall be coated as follows:

1. **Surface Preparation**
   Factory Primed, clean and dry

2. **First Coat (Indoor Applications)**
   Modified Polyamidoamine Epoxy or High Solids Epoxy

   a. TNEMEC Series 135 Chembuild @ 4 to 6 mils DFT
   OR
   b. Devoe Bar-Rust 235V @ 4 to 6 mils DFT

3. **Second Coat (Indoor Applications)**
   Polyamidoamine Epoxy or High Solids Epoxy

   a. TNEMEC Series V69F Hi-Build Epoxoline @ 4 to 6 mils DFT
   OR
   b. Devoe Bar-Rust 235V @ 4 to 6 mils DFT

4. **First Coat (Outdoor Applications)**
   Modified Polyamidoamine Epoxy or High Solids Epoxy

   a. TNEMEC Series 135 Chembuild @ 4 to 6 mils DFT
   OR
   b. Devoe Bar-Rust 235V (In Winter) or Bar-Rust 231 (In Summer) @ 4 to 6 mils DFT

5. **Second Coat (Outdoor Applications)**
   Aliphatic Acrylic Polyurethane

   a. TNEMEC Series 1075 Endura-Shield II @ 3 to 5 mils DFT
   OR
   b. Devoe Devthane 379H @ 2 to 3 mils DFT

D. System Number 10 – (Outdoor Coating) Exterior of Concrete Masonry Units and Concrete Walls (Clear Water Repellent and Anti Graffiti Coating)

The exterior of concrete masonry unit block walls, split face block walls, or concrete walls that are in public areas that may be exposed to graffiti and that are exposed to weather, driving rain and mildew, shall be coated with a clear water repellent anti-graffiti coating as follows:

1. **Surface Preparation**
   CMU: Allow mortar to cure for 14-days minimum. Level protrusions and mortar splatter.
   Concrete: Allow new concrete to cure for 30-days minimum, followed by abrasive blast in accordance with manufacturer's instructions.

2. **First Coat**
   RTV Silicone Rubber Water Repellent or Polysilane Graffiti Protectant

   a. TNEMEC Series V626 Dur-A-Pell GS @ 65 to 85 sf/gallon
   OR
   b. Rain Guard Blok-Lok or Microseal @ 60 to 120 sf/gallon

3. **Second Coat**
   RTV Silicone Rubber Water Repellent or Co-polymer Graffiti Protectant

   a. TNEMEC Series V626 Dur-A-Pell GS @ 65 to 85 sf/gallon
   OR
   b. Rain Guard Vandl-Guard @ 125 to 175 sf/gallon

4. **Third Coat**
   RTV Silicone Rubber Water Repellent or Co-polymer Graffiti Protectant

   a. TNEMEC Series V626 Dur-A-Pell GS @ 65 to 85 sf/gallon
   OR
   b. Rain Guard Vandl-Guard @ 125 to 175 sf/gallon

E. System Number 12 – (Indoor Coating) Exterior of Concrete Masonry Units and Concrete Walls

Concrete masonry unit walls and concrete walls in the interior of a building or elsewhere shall be coated as follows:

1. **Surface Preparation**
   CMU: Allow mortar to cure for 14-days minimum. Level protrusions and mortar splatter.
   Concrete: Allow new concrete to cure for 30-days minimum, followed by abrasive blast in accordance with manufacturer's instructions.

2. **First Coat**
   Waterborne Cementitious Acrylic or Advanced Technology Waterborne Epoxy

   a. TNEMEC Series 130 Envirofill @ 60 to 115 sf/gallon
   OR
   b. Devoe Bloxfil 4000 @ 50 to 75 sf/gallon
   OR
   c. Devoe Tru-Glaze 4015 @ 50 to 75 sf/gallon

3. **Second Coat**
   Polyamidoamine Epoxy or High Solids Epoxy

a. TNEMEC Series V69F Hi-Build Epoxoline @ 4 to 6 mils DFT
OR
b. Devoe Bar Rust 235V @ 4 to 6 mils DFT

4. Third Coat
Polyamidoamine Epoxy or High Solids Epoxy

a. TNEMEC Series V69F Hi-Build Epoxoline @ 4 to 6 mils DFT
OR
~~b.~~ Devoe Bar-Rust 235V @ 4 to 6 mils DFT

F. System Number 13 – (Indoor Coating) Exterior of Sheet Rock
The sheet rocked walls and ceilings in the interior of the station building shall be coated as follows:

1. Surface Preparation
Sand joint compound until smooth and feather-edges. All surfaces shall be dry.

2. First Coat
Vinyl Acrylic

a. TNEMEC Series 51 PVA Sealer @ 1 to 2 mils DFT
OR
b. Glidden Professional 1030N PVA Wall Primer & Sealer @ 350 sf/gallon

3. Second Coat
Polyamidoamine Epoxy or High Solids Epoxy

a. TNEMEC Series V69F Hi-Build Epoxoline @ 4 to 6 mils DFT
OR
b. Devoe Bar Rust 235V @ 4 to 6 mils DFT

4. Third Coat
Polyamidoamine Epoxy or High Solids Epoxy

a. TNEMEC Series V69F Hi-Build Epoxoline @ 4 to 6 mils DFT
OR
b. Devoe Bar-Rust 235V @ 4 to 6 mils DFT

G. System Number 14 – (Indoor Coating) Exterior of Chemical Room Components (High Chemical Concentrations)
The concrete masonry unit walls, sheet rocked walls, and moldings of the chemical treatment rooms that are exposed to high concentrations of chlorine, fluoride, or other chemicals shall be coated as follows. Chemical rooms with low concentrations of chemicals shall be coated per the applicable System Numbers 11 or 12.

1. **Surface Preparation**
   CMU: Allow mortar to cure for 14-days minimum. Level protrusions and mortar splatter.
   Concrete: Allow new concrete to cure for 30-days minimum, followed by abrasive blast in accordance with manufacturer's instructions.
   Sheet Rock: Sand joint compound until smooth and feather-edges. All surfaces shall be dry.

2. **First Coat**
   Waterborne Cementitious Acrylic or Advanced Technology Waterborne Epoxy

   a. TNEMEC Series 130 Envirofill @ 60 to 115 sf/gallon
   OR
   b. Devoe Bloxfil 4000 @ 50 to 75 sf/gallon

3. **Second Coat**
   Polyamine Novolac Epoxy

   a. TNEMEC Series 282 Tneme-Glaze @ manufacturer's recommended DFT
   OR
   b. Devoe Devran 124 or Devmat 111 @ manufacturer's recommended DFT

4. **Third Coat**
   Polyamine Novolac Epoxy

   a. TNEMEC Series 282 Tneme-Glaze @ manufacturer's recommended DFT
   OR
   b. Devoe Devran 124 or Devmat 111 @ manufacturer's recommended DFT

H. System Number 15 – (Indoor Coating) Exterior of Concrete Floors

All concrete floors in the building shall have a non-skid protective coating suitable for moderate chemical exposure and heavy traffic and impact exposure. The Contractor shall be responsible for any preparatory work required by the coating manufacturer. The Contractor shall supply a 2-foot minimum square mockup of the concrete floor anti-skid coating system for approval by the Engineer prior to beginning work on the floor.

1. **Surface Preparation**
   Allow new concrete to cure for 30-days minimum, followed by abrasive blast or mechanical abrasion in accordance with manufacturer's instructions.

2. **First Coat**
   Modified Polyamine Epoxy or Chelated Polymeric Oxirane

   a. TNEMEC Series 201 Epoxoprime @ 6 to 12 mils DFT

OR
b. Devoe Pre-Prime 167 @ 1.5 mils DFT

3. Second Coat
Polyamine Novolac Epoxy (immediately following the coating, broadcast selected silica between 3 to 5 lbs/gallon of applied coating)

a. TNEMEC Tneme-Glaze Series 282 @ 6 to 12 mils DFT
OR
b. Devoe Devran 124 @ 10 to 12 mils DFT

4. Third Coat
Polyamine Novolac Epoxy (before coating, remove excess silica when dry to foot traffic)

a. TNEMEC Tneme-Glaze Series 282 @ 6 to 12 mils DFT
OR
b. Devoe Devran 124 @ 10 to 12 mils DFT

I. System Number 16 – (Outdoor Coating) Exterior of PVC and Fiberglass Piping and Conduit Materials
The exterior of PVC and fiberglass piping and conduits exposed to weather and ultraviolet light shall be coated as follows:

1. Surface Preparation
PVC and Fiberglass surfaces shall be wiped with a clean rag and clean solvent compatible with the specified coating prior to coating application. Scarify all PVC or Fiberglass surfaces prior to coating.

2. First Coat
Polyamidoamine Epoxy or Waterborne Epoxy Primer

a. TNEMEC Series V69F Hi-Build Epoxoline @ 4 to 6 mils DFT
OR
b. Devoe Devran 203 @ 3 to 4 mils DFT

3. Second Coat
Aliphatic Acrylic Urethane

a. TNEMEC Series 1075 Endura-Shield II @ 3 to 5 mils DFT
OR
b. Devoe Devthane 379H @ 2 to 3 mils DFT

J. System Number 17 – (Indoor Coating) Exterior of PVC and Fiberglass Piping and Conduit Materials
The exterior of PVC and fiberglass piping and conduits that are located inside buildings or

enclosures and are not exposed to weather and ultraviolet light shall be coated as follows:

1. **Surface Preparation**
   PVC and Fiberglass surfaces shall be wiped with a clean rag and clean solvent compatible with the specified coating prior to coating application. Scarify all PVC or Fiberglass surfaces prior to coating.

2. **First Coat**
   Polyamidoamine Epoxy or Waterborne Epoxy Primer

   a. TNEMEC Series V69F Hi-Build Epoxoline @ 4 to 6 mils DFT
   OR
   b. Devoe Devran 203 @ 3 to 4 mils DFT

3. **Second Coat**
   Polyamidoamine Epoxy or Waterborne Epoxy

   a. TNEMEC Series V69F Hi-Build Epoxoline @ 4 to 6 mils DFT
   OR
   b. Devoe Bar-Rust 235V @ 4 to 6 mils DFT

K. System Number 18 – (Outdoor Coating) Exterior of Aluminum (Gutters and Downspouts), Non-Ferrous Metals (Copper, Brass, or Bronze), and Galvanized Metal

Exterior aluminum materials such as gutters and downspouts, non-ferrous metals such as copper, brass or bronze, and galvanized metal such as conduits, pipe hangers and pipe supports that are to be painted rather than repaired with zinc coating and that are exposed to weather shall be coated as follows:

1. **Surface Preparation**
   Remove water-soluble dirt and chemicals with water and detergent and solvent-soluble contaminates with Solvent Clean (SSPC 1). Allow to dry and then Hand Tool (SSPC 2) or Power Tool (SSPC 3) to remove oxides. Scarify to provide a minimum 1-mil profile to aid adhesion.

2. **First Coat**
   Polyamidoamine Epoxy or Waterborne Epoxy Primer

   a. TNEMEC Series V69F Hi-Build Epoxoline @ 4 to 6 mils DFT
   OR
   b. Devoe Devran 203 @ 3 to 4 mils DFT

3. **Second Coat**
   Aliphatic Acrylic Urethane

   a. TNEMEC Series 1075 Endura-Shield II @ 3 to 5 mils DFT

OR
b. Devoe Devthane 379H @ 2 to 3 mils DFT

L. System Number 19 – (Indoor Coating) Exterior of Aluminum (Ducting), Non-Ferrous Metals (Copper, Brass, or Bronze), and Galvanized Metal

Interior aluminum materials such as ducting, non-ferrous metals such as copper, brass or bronze, and galvanized metal such as conduits, pipe hangars and pipe supports that are to be painted rather than repaired with zinc coating and that are not exposed to weather shall be coated as follows:

1. Surface Preparation

Remove water-soluble dirt and chemicals with water and detergent and solvent-soluble contaminates with Solvent Clean (SSPC 1). Allow to dry and then Hand Tool (SSPC 2) or Power Tool (SSPC 3) to remove oxides. Scarify to provide a minimum 1-mil profile to aid adhesion.

2. First Coat

Polyamidoamine Epoxy or Waterborne Epoxy Primer

a. TNEMEC Series V69F Hi-Build Epoxoline @ 4 to 6 mils DFT
OR
b. Devoe Devran 203 @ 3 to 4 mils DFT

3. Second Coat

Polyamidoamine Epoxy or High Solids Epoxy

a. TNEMEC Series V69F Hi-Build Epoxoline @ 4 to 6 mils DFT
OR
b. Devoe Bar-Rust 235V @ 4 to 6 mils DFT

M. System Number 21 – (Outdoor Coating) Exterior of Wood

Exterior wood such as tails, trim, soffits and all other wood that is exposed to weather or highly humid atmospheres shall be coated as follows:

1. Surface Preparation

Sand rough areas. Ensure wood is dry before coating. Seal knots and pitch pockets and fill cracks and nail holes after primer has cured.

2. First Coat

Waterborne Modified Polyamine Epoxy or Acrylic Resin

a. TNEMEC Series 151-1051 Elasto-Grip FC @ manufacturer's recommended DFT
OR
b. Glidden Professional Hydrosealer @ 350 to 400 sf/gallon
OR

c. Kelly-Moore Paint Co. #255 Acry-Shield Primer 250 to 300 sf/gallon

3. Second Coat
Acrylic Emulsion

a. TNEMEC Series 180 W.B. Tneme-Crete @ 4 to 10 mils DFT
OR
b. Glidden Professional Fortis 350 @ 350 to 400 sf/gallon
OR
c. Kelly-Moore Paint Co. #1245 Acry-Shield 100% Acrylic Ext. Finish Low-Sheen @ 250 to 300 sf/gallon

4. Third Coat
Acrylic Emulsion

a. TNEMEC Series 180 W.B. Tneme-Crete @ 4 to 10 mils DFT
OR
b. Glidden Professional Fortis 350 @ 350 to 400 sf/gallon
OR
c. Kelly-Moore Paint Co. #1245 Acry-Shield 100% Acrylic Ext. Finish Low-Sheen @ 250 to 300 sf/gallon

N. System Number 22 – (Indoor Coating) Exterior of Wood
Interior wood such as trim, cabinets and all other wood that is not exposed to weather or highly humid atmospheres shall be coated as follows:

1. Surface Preparation
Sand rough areas. Ensure wood is dry before coating. Seal knots and pitch pockets and fill cracks and nail holes after primer has cured.

2. First Coat
Waterborne Modified Polyamine Epoxy or Waterborne Acrylic Resin

a. TNEMEC Series 151-1051 Elasto-Grip FC @ manufacturer's recommended DFT
OR
b. Glidden Professional 3210 Gripper Primer/ Sealer @ 300 to 450 sf/gallon
OR
c. Kelly-Moore Paint #287 Adhesion Plus Primer @ 250 to 300 sf/gallon

3. Second Coat
Modified Polyamine Epoxy or Waterborne Epoxy Polyamide

a. TNEMEC Series 280 Tneme-Glaze @ manufacturer's recommended DFT
OR
b. Devoe Tru-Glaze-WB 4426 Epoxy @ 2 to 4 mils DFT

4. **Third Coat**
   Modified Polyamine Epoxy or Waterborne Epoxy Polyamide

   a. TNEMEC Series 280 Tneme-Glaze @ manufacturer's recommended DFT
   OR
   b. Devoe Tru-Glaze-WB 4426 Epoxy @ 2 to 4 mils DFT

O. System Number 24 – (Indoor/Outdoor Coating) Interior and/or Exterior Fusion Bonded Epoxy Coating

The interior and/or exterior of piping to be coated with fusion bonded epoxy as indicated on the drawings, shall be as follows:

1. **Surface Preparation**
   All surface irregularities, welds and weld spatter shall be ground smooth to a 1/8 inch radius. All surfaces shall be blasted to near-white metal in accordance with Steel Structures Painting Council Surface Preparation Specification SSPC 10 or NACE No. 2 near-white finish.

2. **First Coat**
   Thermosetting dry powder epoxy

   a. 3M Company Scotchkote 206N @ 10 to 16 mils DFT

P. System Number 25 – (Indoor/Outdoor Coating) Interior and/or Exterior of Fusion Bonded Epoxy Coating Repair

Defects in factory applied fusion bonded coatings for buried and non-buried applications shall be repaired with a manufacturer-approved liquid repair material for use at the project site. Contractor shall use all available means to protect coating from damage during shipping. Items will be rejected for extensive damage. Welding of coated segments will not be permitted.

Fusion bonding applicator shall submit to the Engineer the procedure to be employed for surface preparation, liquid coating application, and holiday inspection. Manufacturer's product data sheets shall be included. Alternates to materials specified will be considered subject to the approval of the Engineer.

All sharp edges and corners shall be ground smooth and all weld spatter, slag burrs, and other objectionable surface conditions must be removed prior to the surface preparation for coating. Lightly abrade or sandblast the existing Scotchkote 206N coating on either side of welds before application of the liquid epoxy coating.

All pinholes, welds and damaged areas shall be patched with Scotchkote 312 coating, a two-component, 80% solids liquid epoxy coating. The thickness of the coating shall be a minimum of 10 mils and not exceed 16 mils.

Small nicks or chips in the Scotchkote 206N coating caused by field handling should be prepared prior to the application of Scotchkote 312 coating using a suitable solvent to remove all oils, grease, oxidation or other contaminants. If rust is apparent in the damaged area, remove as much as possible by wire brushing, grinding, filing or sanding. If the damaged area is more extensive, it is advisable to abrade or lightly sandblast to roughen the surface of the Scotchkote 206N coating before solvent washing and application of Scotchkote 312. Again, care should be taken to remove as much rust as possible in an attempt to achieve a white metal surface.

Finish shall be pinhole free and checked, after cure, for continuity using a holiday detector in accordance with the coating manufacturer's instructions. All voids, cracks, and damaged areas will be touched up.

PART 3 – EXECUTION

3.01 GENERAL

A. No paint shall be reduced or applied in any way except as herein specifically called for, or as recommended by the manufacturer. Should conflict occur between specifications and manufacturer's recommendations and/or standard practice, the Engineer shall be notified prior to bid submittal for clarification.

B. It is the responsibility of the Contractor to inspect and provide substrata surfaces that are prepared in accordance with these Specifications and the printed directions and recommendations of the paint manufacturer whose product is to be applied.

C. All doors, windows, trim, moldings, base boards, electrical boxes, light fixture boxes, penetrations through the ceilings, walls or floors, shall be caulked prior to coating.

3.02 MATERIAL DELIVERY AND STORAGE

A. All materials shall be new and shall be delivered to the worksite in unopened containers that plainly show, at the time of use, the designated name, date of manufacturer, and name of manufacturer. Materials shall be stored in a suitable protected area that is heated or cooled as required to maintain temperatures within the range recommended by the manufacturer.

B. Empty and dry paint containers may be disposed of onsite; however wet paint containers or containers with unused product may not be disposed as general debris and must be discarded as hazardous waste or taken back to Contractor's place of business for reuse. Washing of brushes in sinks that flow too sanitary must only be allowed if permitted by the owner or wash water collected and disposed by Contractor.

3.03 AIR QUALITY

A. All coatings shall conform to the pertinent Volatile Organic Compound (VOC) requirements and any other air quality regulations applicable at the location of use. Coating materials which cannot be guaranteed by the manufacturer to conform, whether or not specified by product designation, shall not be used.

3.04 COATING COMPATIBILITY

A. The Contractor shall be responsible for ensuring the compatibility of field coatings with each other or with the coatings on shop coated or previously coated surfaces. Coatings used in the first field coat over shop coated or previously coated surfaces shall cause no wrinkling, lifting, or other damage to underlying coats. Coatings used in successive field coats shall be produced by the same manufacturer.

3.05 PROTECTION OF MATERIALS NOT TO BE PAINTED

A. Remove, mask, or otherwise protect hardware, lighting fixtures, switch plates, aluminum surfaces, machined surfaces, couplings, shafts, bearings, nameplates on machinery and other surfaces not intended to be painted. Provide drop cloths to prevent paint materials from falling on or marring any adjacent surfaces. Protect working parts of all mechanical and electrical equipment from damage during surface preparation and painting process. All openings in motors shall be masked to prevent paint and all other materials from entering the motors.

3.06 PAINT MIXING

A. Multiple-component coatings shall be prepared using all of the contents of the container for each component as packaged by the paint manufacturer. No partial batches will be permitted. Multiple-component coatings that have been mixed shall not be used beyond their pot life.

3.07 SCAFFOLDING

A. All necessary scaffolding shall be furnished and installed by the Contractor. Such scaffolding shall conform to regulations of the State Industrial Accident Commission and local ordinances.

3.08 SAFETY

A. Painting shall be performed in strict accordance with the safety recommendations of the paint manufacturer; with the safety recommendations of the National Association of Corrosion Engineers contained in the publication, Manual for Painter Safety; Federal, state, and local agencies having jurisdiction. All necessary ventilation, lighting equipment, and scaffolding shall be furnished and installed by the Contractor.

B. All necessary precautions shall be taken to prevent fire. Rags and waste soiled with paint shall be removed from the premises at the end of each day's work, or stored in metal

containers with metal covers.

3.09 SURFACE PREPARATION

A. Metal Surface Preparation

All sharp edges and corners shall be ground smooth and all weld spatter, slag burrs, and other objectionable surface conditions must be removed prior to the surface preparation for coating.

No surface preparation blasting will be permitted prior to submission of samples. All workmanship for metal surface preparation as specified shall be in strict conformance with the current Steel Structures Painting Council (SSPC) Specifications as follows:

Solvent Cleaning	SSPC 1
Hand Tool Cleaning	SSPC 2
Power Tool Cleaning	SSPC 3
Flame Cleaning	SSPC 4
White Metal Blast Cleaning	SSPC 5
Commercial Blast Cleaning	SSPC 6
Brush-Off Blast Cleaning	SSPC 7
Pickling	SSPC 8
Weathering Followed by Blast Cleaning	SSPC 9
Near-White Blast Cleaning	SSPC 10
Power Tool Cleaning to Bare Metal	SSPC 11
Ultra-High Pressure Water Jetting	SSPC 12
Concrete	SSPC 13

Coat abrasive blast-cleaned surfaces with primer before visible rust forms on surface. Do not leave blast-cleaned surface uncoated for more than 8-hours.

Alternatives to standard abrasive blast cleaning methods, will be permitted subject to a review by the Engineer.

Where OSHA or EPA regulations preclude standard abrasive blast cleaning, wet or vacu-blast methods may be required. Coating manufacturer's recommendations for wet blast additives and first coat application shall apply.

B. Other Surfaces

All other surfaces shall be prepared in accordance with these specifications and the manufacturer's recommendations.

3.10 APPLICATION OF PAINT

A. General

Manufacturer's written instructions for applying each type of paint or protective coating shall

be furnished to the Engineer prior to application. Cleaned surfaces and all coats shall be inspected prior to the succeeding coat. Schedule such inspection with the Engineer in advance. Apply all coatings in strict accordance with the paint manufacturer's recommendations, as approved by the Engineer. Succeeding coats shall be painted in a different color to facilitate inspection. Final colors shall be as selected by the City. Sufficient time shall be allowed between coats to assure thorough drying of previously applied paint. Coating shall be applied in a neat manner that will produce an even film of uniform and proper thickness, with finished surfaces free of runs, sags, ridges, laps, and brush marks. Units to be bolted together shall be painted prior to assembly or installation, unless otherwise specified.

B. Shop Primed Surfaces

All shop primed items shall be inspected at the jobsite for compliance with these Specifications. Schedule such inspection with the Engineer in advance. Areas of chipped, peeled, or abraded primer shall be hand or power sanded feathering the edges. The areas shall then be spot primed with the specified primer.

C. Manufacturer Applied Paint Systems

Abraded areas on factory finished items shall be repaired in strict accordance with the manufacturer's directions. Repaired areas shall be carefully blended into the original finish.

D. Film Thickness

Coverage is listed as either total dry film thickness in mils (DFT) or the spreading rate in square feet per gallon (sf/gallon). The number of coats is the minimum required irrespective of the coating thickness. Additional coats may be required to obtain the minimum required paint thickness, depending on method of application, differences in manufacturers' products, and atmospheric conditions. Maximum film build per coat shall not exceed the coating manufacturer's recommendations.

E. Damaged Coatings

Damaged coatings, pinholes and holidays shall have the edges feathered and repaired in accordance with the recommendations of the paint manufacturer, as approved by the Engineer. Re-coat entire surface where touch-up result is visibly different, either in sheen, texture, or color.

F. Unsatisfactory Application

Work shall be free of runs, bridges, shiners, laps, delamination, wrinkling, peeling, blistering, cracks, chips, abrasions or other imperfections. Evidence of these conditions shall be cause for rejection. All visible areas of imperfections shall be hand- or power-sanded feathering the edges. The areas shall then be primed and finish coated in accordance with the Specifications. Depending on the extent of repair and its appearance, a finish sanding and topcoat may be required by the Engineer.

If the item has insufficient film thickness, the surface shall be cleaned, and then prepared as required by the manufacturer taking into account the recoat window, and top coated with the

specified paint material to obtain the specified appearance and coverage. Specific surface preparation requirements shall be determined by the coating manufacturer, as approved by the Engineer.

All areas of overspray including floors, windows, and equipment shall be cleaned or repainted if unable to be cleaned, to the satisfaction of the Engineer.

Leave all staging up until areas are inspected and approval is given by the Engineer, for each surface or coating. Staging removed prior to inspection shall be replaced.

Any defects in the coating system shall be repaired by the Contractor per written recommendations of the coating manufacturer, at no additional cost to the City

3.11 SHIPPING

A. In all cases where pre-coated items are to be shipped to the jobsite, all efforts shall be made to protect the coating from damage. Coated items shall be battened to prevent abrasion. Contractor shall use nonmetallic or padded slings and straps in handling. Items will be rejected for excessive damage.

3.12 TOUCH-UP PAINT

A. The Contractor shall leave a minimum of 1-gallon of paint for each type and color used on the project for the City's use in future maintenance operations. Appropriate touch-up paint for factory coated items including factory coated electrical panels, gutters, and doors and window frames, shall be delivered to the City.

3.13 ANNIVERSARY INSPECTION

A. Schedule

A first anniversary warranty inspection of all painted surfaces will be conducted by the City, approximately eleven (11) months from the date of recording the Notice of Completion. The City shall establish the date of the inspection and will notify the Contractor at least thirty (30) calendar days in advance of the inspection.

B. Equipment

The Contractor shall furnish ventilation, scaffolding, and lighting equipment as necessary for warranty inspections, and shall be present for such inspections.

C. Inspection Report

The City will prepare and deliver to the Contractor a report of the warranty inspection, prior to the expiration of the 12-month warranty period. The inspection report will set forth the number and types of failures observed, the percentage of surface area where failures have occurred, and the names of the persons making the inspections. Photographs or reports of the coating imperfections or failures shall be considered acceptable evidence of failure.

D. Failure

Any location where coating has delaminated, peeled, blistered, or cracked; and any location where rusting is evident will be considered a failure of the coating system.

E. Remedial Work

Repair all failures by removing the deteriorated coating, cleaning the surface, and recoating with the same system in accordance with this Section and the coating manufacturer. With the approval of the City, surface preparation of small failures (areas less than 1 sq./ft.) may be made by cleaning to bare metal in accordance with appropriate SSPC-SP standards.

F. Schedule of Remedial Work

The City shall establish a starting date and reasonable time of completion for the remedial work. The starting date shall be no more than thirty (30) calendar days after the submittal of the inspection report to the Contractor. Should the Contractor fail to start the remedial work within ten (10) calendar days after the starting date established by the City, the City may at its option perform the remedial work, and the Contractor shall pay to the City the actual cost of such work, plus 20-percent to cover added engineering and administrative cost.

G. Cost

Warranty inspections of the remedial work shall be at the expense of the Contractor.

PART 4 – MEASUREMENT AND PAYMENT

All work as specified herein, satisfactorily completed, shall be paid for on a Lump Sum basis as stated in **Bid Item Schedule** for the item listed below:

Bid Item No. 14 – PAINTING

-END OF SECTION-

COATING SYSTEM DATA SHEET

Surface Description:	System Number:

Surface Preparation Description:	

Coating	**DFT (mils)**	**Color**	**Manufacturer and Product**
First Coat (Primer)			
Touch up			
Second Coat			
Third Coat			
Total System			Not less than minimum thickness specified

Notes: (Attached if needed.)

Project:
Painting Contractor:

Attach Technical Data Sheet (if applicable) for each paint system submittal.

SECTION 10050 - BUILDING

Bid Item No. 15

PART 1 - GENERAL

1.01 SCOPE

A. This Section covers all work necessary to furnish materials and construct the pump station building. The building shall have masonry block walls with steel reinforcing extending into the concrete floor and foundation. All wall cells and all masonry blocks are to be joined with masonry mortar and filled with masonry grout. The building floor shall be of reinforced concrete construction as shown on the plans. The roof is to be a 4 ply roofing system, with composition roof shings as shown on the Drawings. The roof and removable section shall include a skylight and shall be supported by light metal trusses. The removable section of roof shall not be installed with ceiling materials. The remainder of the ceiling shall be installed with gypsum drywall. The remainder of the roof shall be permanently mounted. Care is to be taken to ensure that the roof does not leak at the permanent section and removable section interface. At the roof interface, a plywood facing shall be installed on the outer wooden trusses to contain the ceiling compartment. Both the interior and exterior of the building are to be painted. Colors shall be as selected by the City. The Contractor shall furnish all labor and materials needed to complete the work included in this section, complete.

1.02 SUBMITTALS

A. Contractor shall submit manufacturer's specifications and installation instructions for the following products, in accordance with SECTION 01330 - PROJECT RECORDS AND SUBMITTALS. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

PART 2 - MATERIALS

2.01 CONCRETE

A. All concrete shall comply with the requirements of SECTION 03300 - CONCRETE.

2.02 MASONRY MORTAR AND GROUT

A. All masonry mortar and grout shall comply with the requirements of SECTION 03600 - GROUT.

2.03 MASONRY BLOCKS

A. All masonry blocks shall comply with the requirements of SECTION 04200 - CONCRETE MASONRY UNITS.

2.04 LUMBER

A. All lumber shall comply with the requirements of SECTION 06100 - ROUGH CARPENTRY.

2.05 ROOFING

A. All roofing shall comply with the requirements of SECTION 07420 – COMPOSITE SHINGLE ROOFING.

2.06 METAL DOORS AND FRAMES

A. All metal doors shall comply with the requirements of SECTION 08110 - METAL DOORS AND FRAMES.

2.07 FINISH HARDWARE

A. All finish hardware shall comply with the requirements of SECTION 08710 – FINISH HARDWARE.

2.08 PAINTING

A. All painting shall comply with the requirements of SECTION 09900 - PAINTING.

2.09 VENTILATION

A. All ventilation components shall comply with the requirements of SECTION 15700 - VENTILATION.

2.10 WINDOWS

A. Windows shall be fixed, manufactured with aluminum frames, with clear tempered glass complete with glazing, and shall be located as specified on the Drawings. Windows shall be 3 feet wide by 2 feet tall. Frames shall be factory primed and coated and Owner shall select finish color. Windows shall be Seasons Commercial Division Model 2000, International Window Corporation Keltic 7223, or approved equal.

2.11 WALLBOARD

A. Gypsum wallboard shall be 5/8-inch thick, type Regular, provided in maximum lengths available to minimize end-to-end joints, with tapered edges, and shall comply with ASTM C36 and ASTM C840 for application system and support spacing indicated. Gypsum wallboard and related materials shall be supplied by Domtar Gypsum Co., Georgia-Pacific Corp., Gold Bond Building Products Div., National Gypsum Co., United States Gypsum Co., or approved equal.

B. Provide joint materials complying with ASTM C475, ASTM C840, and recommendations of manufacturer. Provide paper joint reinforcing tape and factory-prepackaged, job mixed, chemical-hardening, setting type powder joint compounds formulated for intended use. Factory-prepackaged vinyl based drying type joint compound formulated for intended use shall be used for embedding tape and for first coast over fasteners and flanges of trim, and topping compound formulated for second and third coats.

C. Gypsum board screws shall comply with ASTM C1002.

D. For ceilings, provide special finishing joint compounds as recommended by the manufacturer.

1. First Application
USG Sheetrock Lightweight Setting Type (Easy Sand) Joint Compound

2. Topping and Skimming
Top and skim entire surface with Sheetrock Lightweight All-Purpose Joint Compound ReadyMixed (Plus 3).

3. Texture and Surface Primer
Texture and prime to equalize porosity and texture with Sheetrock First Coat.

2.12 IRRIGATION CONTROLLER

A. The irrigation controller is to be wall mounted, and shall be a Rainbird 22 Station ESP-ME.

2.13 REMOVABLE SKYLIGHT

A. The skylight shall be factory fabricated and preassembled in largest size assemblies consistent with economic considerations for shipping to and handling at the job site. All cap retainers shall be attached using stainless steel fasteners. These fasteners shall be designed and located such that all glazing strips are compressed to provide a uniform compression seal. Fasteners shall be located at 12" O.C. or less. All clips for the attachment of the rafter bars shall be of aluminum or stainless steel and by shop-riveting, bolting or welding to the rafter bars attain fully rated structural loading. All welding shall be by the heliarc process. All exposed welds to be dressed where practical. Waterproofing shall not be reliant on additional continuous exterior silicone sealant beads. Horizontal flush butt joints may rely on a continuous silicone seal. Silicone or neoprene setting blocks shall be used for the support of the glass and shall be sized and located in accordance with the glass manufacturer’s recommendations. At no point shall the glass come into contact with metal parts of the skylight. Skylights shall have a properly designed weep system for drainage to the exterior without excessive air infiltration.

B. No water penetration shall occur when system is tested in accordance with ASTM E331. Deflection of skylight framing members shall not exceed L/175 when subject to a uniform load deflection test in accordance with ASTM E330. Air infiltration through the skylight assembly

when tested in accordance with ASTM E283 shall not exceed 0.06 cubic feet per minute per square foot of fixed area. Skylights shall be Bristolite® Fiberlite Curb Mounted Louvered Skylight Model # SL-CM-1-FTH-IR-HW-SR-MF or approved equal.

2.14 FIBERGLASS INSULATION

A. Framed ceilings shall be insulated with fiberglass batts. The batts installed in 2x4 walls shall be a minimum 3-½ -inches thick and shall have a minimum insulation factor of R-13. The batts installed in 2x6 walls shall be a minimum 5-½ -inches thick and shall have a minimum insulation factor of R-19. Batts used to insulate ceilings shall be a minimum of 10-inches thick and shall have a minimum insulation factor of R-30. Fiberglass batts shall be foil faced as manufactured by Owens Corning, or approved equal.

2.15 MOLDED FIBERGLASS GRATING

A. Molded fiberglass grating shall be made in one-piece construction by interweaving continuous thoroughly wetted fiberglass strand with a sodium hypochlorite and ammonia hydroxide corrosion resistant resin system with ultraviolet (UV) inhibitors. Grating shall be a minimum of 2-inches thick and 2-inches square mesh designed to support a minimum of 200-pounds per square foot uniform load with deflection not to exceed 0.250 inches, and shall be the manufacturer's standard color. Surface shall be concave top. Grating shall be McNichols Fibergrate, Strongwell Duragrate, Gridwalk High Strength Molded Grating, or approved equal.

B. All fasteners including clips, bolts, nuts and washers shall be type 316 stainless steel grating clips.

C. Grating supports shall be constructed of fiberglass with a corrosion resistant Vinyl Ester resin system conforming to ASTM E84 Class 1 and ASTM D635.

2.16 CHEMICAL ROOM FIXTURES AND ACCESSORIES

A. Chemical room accessories shall be surface mounted for concrete or masonry construction, unless otherwise specified. All items shall be of Type-304 stainless steel, with No. 4 finish. The Contractor shall provide bathroom accessories as follows:

1. **Sink and Faucet**
   The Contractor shall provide and install a 37" x 30" x 37" vanity with SS sink with dimensions of 21 ½" x 15 ½" x 7" manufactured by Blair Company, Model #K-111 or approved equal.

2. **Soap Dispenser**
   The soap dispenser shall be Grainger, Stock No. 5W626, Bobrick B-4063 or approved equal.

3. **Towel Dispenser**

The towel dispenser shall be Grainger Stock No. 5W551, Bobrick B-3949 or approved equal.

4. **Waste Receptacle**
   Metal, white enamel finish or stainless steel with swing top enclosure, 10.5 gallon minimum.

5. **Mirror**
   The mirror shall be Bobrick B-290 2436, or approved equal.

2.17 TANK-LESS WATER HEATER

A. The tank-less water heater shall provide continuous hot water on demand. The water heater shall be rated to provide hot water at a temperature of 105 degrees F from 55 degree source water at 1.5 gallons per minute. The water shall be 240 V, 9 kW, with a rated maximum full load amp rating of 38A. The water heater shall be mounted to the wall of the chemical room and plumbed to serve hot water to the chemical sink. The water heater shall be a Rheem Model RTE 9, or approved equal.

2.18 MISCELLANEOUS HARDWARE

A. Wood Screws
Wood screws shall be FS FF-S-111C and Am-1.

B. Nails
All nails shall be Common wire, FS FF-N-105a and Int. Am-2. Box nails are not permitted unless specifically noted. Use annular ring shank and spiral type nails where called for on the Drawings.

C. Bolts and Nuts
Bolts and nuts shall be FS FF-B575C and FS-FF-N-836C and Am-1.

D. Lagbolts
All lagbolts shall be FS FF-B-561b.

E. Expansion Bolts
Expansion bolts shall be Red Head, We-It, or equal.

F. Washers
Washers shall be malleable iron or steel plate, cut washers are not permitted.

G. Gauge Metal Items
All gauge metal items (11 gauge and lighter) shall be fabricated from steel sheet, heavily galvanized. Except where heavier gauges are called for on the Drawings, gauge metal items shall not be lighter in gauge than the following:

Joist Hangers

For 2-inch thick members:	16 gauge
For 3-inch and thicker members:	12 gauge
Framing Anchors:	18 gauge
Framing Clips:	16 gauge
Reinforcing Angles:	16 gauge
Post Caps:	16 gauge
Post Bases:	12 gauge
Tie Straps:	As Noted

2.19 HOSES AND HOSE RACKS

A. Contractor shall provide 5/8-inch commercial hoses, commercial hose nozzles, and hose racks as indicated on the drawings. Each hose should be of sufficient length to reach each wall within the pump station.

PART 3 - EXECUTION

3.01 FIBERGLASS BATS

A. Fiberglass bat insulation shall be installed between all ceiling joists. Install fiberglass insulation in accordance with manufactures recommendations and building code requirements. Install bats with tight contact between insulation and framing. Use fasteners and fastener spacing as required by manufacturer. Cleanly cut and tightly fit batts around electrical and plumbing components. Keep ventilation space unobstructed. Keep rips and surface damage minimal; repair damage wherever it occurs. Clean the work area and remove all scrap and excess materials from the site. Repair or replace defective work as directed by the Engineer.

3.02 MOLDED FIBERGLASS GRATING

A. Contractor shall use a heavy-duty rotary saw with either a masonry carbide or diamond coated blade with the panel turned bottom-side up. All cut edges shall be ground smooth using a coarse grit open coated (resin) grinding disk. All cut surfaces shall be coated with a light coating of a two-part resin system or a urethane spray paint to prevent corrosion of glass fibers. Safety precautions shall be taken when cutting fiberglass materials including safety goggles, dust mask, and gloves to protect the eyes, reduce dust inhalation and prevent skin irritation.

B. Panels shall be supported on all sides and attached to the supporting framework with hold down clips. A minimum of four clips per side are required for full size panels. Use end panel clips to unite two adjacent panels, where panels cannot be supported on all sides.

3.03 GYPSUM BOARD

A. Install and finish gypsum board to comply with ASTM C840.

B. Gypsum board installed on walls shall be nailed/screwed to all wall studding and supports. Contractor may use single nailing which requires nails/screws to be spread 8” apart along all supports/studding or double nailing which requires nails/screws at edges of gypsum sheets to be spread 8” apart and double anchoring 12” apart in middle area of gypsum sheets with nails/screws 2” to 2 ½” apart.

C. Gypsum board installed on ceilings shall be nailed/screwed to all truss chords and supports. Contractor may use single nailing which requires nails/screws to be spread 7” apart along all supports/studding or double nailing which requires nails/screws at edges of gypsum sheets to be spread 7” apart and double anchoring 12” apart in middle area of gypsum sheets with nails/screws 2” to 2 ½” apart.

D. Nails/screws shall first be driven in the middle area of the board and then outward towards the edges and ends. Nails/screws shall be fastened no less than 3/8” from edges of gypsum sheets along all supports/studding.

E. The Contractor shall "dimple" all nails/screws to just below the surface of the board. Damaged or torn wallboard will be rejected. Joints and inside corners are to be sealed with perforated tape embedded in joint compound. Outside corners are to be sealed with a metal bead, nailed in place, and finished with jointing compound. All nail/screw dimples shall be filled with joint compound.

F. All ceilings, with the exception of the removable section of the building, shall be finished with wallboard (sheet rock). Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 24-inches in alternate courses of board. Install ceiling boards across framing in a manner which minimizes the number of end-butt joints, and which avoids end joints in the central area of the ceiling. Stagger end joints at least 24-inches. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards; butt boards together for a light contact at edges and ends with not more than 1/16-inch open space between boards; do not force into place. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field-cut ends. Do not place tapered edges against cut edges or ends.

G. Where wallboard meets with the block wall, the Contractor shall install a 1-inch x 4-inch molding around the complete perimeter of the room.

H. Apply joint treatment at gypsum board joints (both directions), flanges of corner bead, edge trim, and control joints; penetrations; fastener heads, surface defects and elsewhere as required. Prefill open joints and rounded or beveled edges, if any, using setting-type joint compound. Apply joint tape at joints between gypsum boards, except where trim accessories are indicated. Provide smooth finish for interior gypsum wallboard by applying the following joint compounds in 3 coats (not including prefill of openings in base), and sand between coats and after last coat.

I. Use materials and methods required to achieve a uniform appearance. Fill joints and set tape in setting type compound specified. Use drying type compound for second coat on joints and for skim coat entire surface for uniformity and apply initial texturing material to surfaces using specified material.

J. All wallboard and moldings shall be painted in accordance with SECTION 09900 - PAINTING of these specifications.

3.04 FIXTURES, CABINETS, WATER HEATER AND ACCESSORIES

A. Fixtures, cabinets, water heater and all accessories for the bathroom and laboratory shall be securely fastened to the supporting construction in accordance with the manufacturer's instructions. Accessories shall be protected from damage from the time of installation until acceptance. Manufacturer standard warranties shall be provided for all equipment, casework and fixtures.

PART 4 – MEASUREMENT AND PAYMENT

All work as specified herein, satisfactorily completed, shall be paid for on a Lump Sum basis as stated in **Bid Item Schedule** for the item listed below:

Bid Item No. 15 – BUILDING

-END OF SECTION-

SECTION 10440 - SIGNS AND SAFETY EQUIPMENT

Bid Item No. 16

PART 1 - GENERAL

1.01 SCOPE

A. This section covers work necessary to furnish and install all signs, safety equipment, delineators, fire extinguishers, pipe/conduit markers, and all appurtenances as shown on the Drawings and specified herein, complete.

1.02 GENERAL

A. Signs, delineators, pipe markers, and safety equipment shall be furnished and installed as specified herein. Where not specifically indicated or specified, fasteners, posts, and other accessories shall be provided as required and as recommended by the manufacturer of the specific item.

1.03 SUBMITTALS

A. Complete product literature and detailed drawings shall be submitted in accordance with the submittals sections.

PART 2 - MATERIALS

2.01 SIGNS

A. Signs shall be constructed of 0.040 aluminum with a baked enamel finish. Signs shall be for outdoor duty, pre-drill for mounting, and contain OSHA heading descriptions as specified herein. Signs shall be as manufactured by the Seton Name Plate Company (New Haven, CT (800) 243-6624) or an approved equal.

2.02 CONDUIT AND PIPELINE MARKERS

A. All conduit or pipe shall be labeled by means of a pre-formed snap-around outdoor grade acrylic plastic marker with the condition, direction, and type of fluid marked in bold capital letters. The markers must have the proper coating to ensure resistance to acid and/or other corrosive conditions. All markers shall be OSHA and ANSI color coded, lettered, and comply with the requirements of the National Fire Protection Association (NFPA).

2.03 PAINT

A. Paint shall be as specified in SECTION 09900 - PAINTING.

2.04 FIRE EXTINGUISHERS

A. Fire extinguishers shall be all-purpose, nitrogen-pressured, dry chemical type and shall be U.L rated, 10 pound capacity, with a class rating of ABC. Cylinders are to be of heavy-duty steel construction, corrosion and impact resistant with a red polyester epoxy finish and a visual pressure gauge.

2.05 COMBINATION EMERGENCY SHOWER AND EYEWASH STATION

A. A wall and floor mounted emergency shower and eyewash shall be mounted on the inside wall of the chemical feed room adjacent to the entrance and provided with a flow switch, as shown on the Drawings. The eyewash shall conform to ANSI standards and shall have an emergency sign attached. Plastic float-off covers shall be mounted on the eyewash to prevent airborne contamination from entering the eye/face heads. The combination emergency shower and eyewash shall comply with ANSI Z358.1-2009.

   The shower-eyewash station shall be a standard shower combined with a stainless steel dual stream face/eyewash unit. The shower shall have an ABS plastic shower head mounted to a heavy wall galvanized pipe with a 1-1/4 inch NPT or IPT inlet connection. The eyewash shall have a large opening self-adjusting regulator that will provide a flow pattern that meets ANSI standards under minimum flow conditions (30 gpm at 30 psi). The shower head shall be bright yellow for maximum visibility. Shower and face wash shall have chrome-plated brass, minimum 1 inch stay-open ball valves to provide a continuous flow of water while freeing hands and a steel pull rod assembly with an activation graphic attached. The shower-eyewash station shall be catalog No. 56613-489 as manufactured by Van Waters and Rodgers Scientific, catalog model 8300CRP-8309CRP as manufactured by Haws/Axion or an approved equal. The emergency shower and eyewash station shall be equipped with a model SP154DPDT flow switch as manufactured by Haws/Axion or an approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

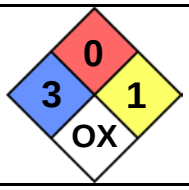
A. Signs and pipe markers shall be installed after all equipment and building surfaces have been primered and painted. Delineators shall be installed after all backfilling and finish grading is complete.

3.02 SIGNS

A. Signs shall be furnished and mounted at various locations described herein, for the purpose of indicating and defining specific hazards throughout the work area.

B. Signs shall be 10” x 7” in size unless otherwise specified.

C. Signs with placement locations are:

Location	No. Required	OSHA Heading	Wording
Above Fire Extinguisher	2	(NONE)	FIRE EXTINGUISHER
On or near pump motor and discharge head	1 ea station	DANGER	EQUIPMENT STARTS AUTOMATICALLY
Above Sodium Hypochlorite Tank	1	DANGER	12.5% SODIUM HYPOCHLORITE CORROSIVE
Above Chlorine Storage Tank	1	CAUTION	EYE PROTECTION AREA
Exterior & Interior Doors to Chemical Treatment Rooms	2	DANGER	CHEMICAL STORAGE
Exterior of Pump Station Doors	2	DANGER	HIGH VOLTAGE
Door to Sodium Hypochlorite Room	1	NFPA 704	

3.03 CONDUITS AND PIPELINES

A. All conduits and pipelines shall be labeled as to the type and condition of fluid conveyed. The following table presents the minimum number of markers required. However, the Contractor shall be responsible for labeling all conduits and pipelines, as identified by the Engineer.

B. Conduits and pipes to be marked are as follows:

Pipe or Conduit	Conduit/Pipe Size	No. Required	Location	Wording for Marker
Well Level Airline	1”	1 ea station	Near Pump Pedestal	WATER WELL LEVEL AIRLINE
Pre-Lube Line	3/4”	1 ea sta	Near Pump Pedestal	PUMP PRE-LUBE
Potable Water Supply	2”	1	Water Manifold	POTABLE WATER
Pre-Lube Line	3/4”	1	Water Manifold	PUMP PRE-LUBE
Pump Control Valve Line	1/2”	1	Water Manifold	PUMP CONTROL VALVE
Eyewash / Shower Line	2”	1	Water Manifold	EYEWASH / SHOWER
Hose Bibb Line	3/4”	1	Water Manifold	HOSE BIBB
Hose Bibb / Irrigation Line	1”	1	Water Manifold	HOSE BIBB / IRRIGATION
Chemical Room Sink Line	1/2”	1	Water Manifold	SINK

3.04 FIRE EXTINGUISHERS

A. The Contractor shall install 2 fire extinguishers at the locations shown in the Drawings. The fire extinguishers shall be wall-mounted, located immediately adjacent to the pump station doors.

PART 4 – MEASUREMENT AND PAYMENT

All work as specified herein, satisfactorily completed, shall be paid for on a Lump Sum basis as stated in **Bid Item Schedule** for the item listed below:

Bid Item No. 16 – SIGNS AND SAFETY EQUIPMENT

-END OF SECTION-

SECTION 13450

PLANT CONTROL AND SCADA SYSTEMS

TABLE OF CONTENTS

PART 1 GENERAL....2
1.01 Summary....2
1.02 Related Sections....2
1.03 Submittals....3
1.04 Close-Out Submittals....3
1.05 Quality Assurance....3
1.06 Scheduling....4
1.07 Warranty....4
1.08 Maintenance....4
1.09 General Control Logic Requirements....4
A. Additional System Functions....5
B. Alarms....5

Security....6
1.10 PLC and HMI SCADA Workstation Display Screens....6
A. General....6
B. System Overview Display....7
D. Well Site Displays....7
1.11 Operator Interface Device Displays....7
A. General....9
1.12 Required Reports....7
A. General....9
B. Monthly Treatment Plant Report....9

PART 2 PRODUCTS....12
2.01 Programmable Logic Controllers (PLCs)....82
2.02 Human Machine Interface (HMI's)....12
2.03 Ethernet Switch....12
2.04 Uninterruptible Power Supply....12
2.05 SCADA workstation....12
2.06 Software Ownership....13

PART 3 EXECUTION....13
3.01 Installation....13
3.02 Field Quality Control....13

PART 4 PLC I/O....13

GENERAL

SUMMARY

The scope of this project is installation of a 60HP vertical Turbine well pump and associated instrumentation with the TESCO PLC's including PLC panels, field installation, programming, new radio installation with radio survey and antenna installation adjustments as needed. All actual control is to be done from the local PLC's. The SCADA is for monitoring, remote set point adjustment and remote mode setting with security levels described later in this specification.

This section specifies the supply, installation, programming, and integration of a Programmable Logic Controller (PLC)-based plant control system that shall control all automated devices and field instruments located at the East Main Well Pump #1 site including well metering pumps, and communicate with the existing main SCADA system including main SCADA system modifications to allow communication.

This section also specifies the revised programming, and integration of an existing supervisory control and data acquisition (SCADA) system that shall provide a Human/Machine Interface (HMI) into the contractor supplied PLC-based plant control system. The existing main SCADA system shall be modified to allow the East Main Well #1 process data to be monitored, displayed, and stored. It shall also allow the control of automated equipment in accordance with operational state and user-authorization requirements.

The PLC-based plant control system shall be capable of fully operating all automatic equipment with or without the SCADA system being in operation.

Work includes all required programming of programmable logic controllers (PLCs), master and slave network devices, network interfaces, a SCADA workstation, human-machine interface / supervisory control and data acquisition (HMI/SCADA) software, autodialer software, and other required hardware and software components to yield a complete and operational system.

The control logic descriptions contained in this Section describe key operational features and requirements. These descriptions do not, however, describe all logical relationships and constraints, time delay criteria, sequences of operation, and other program features that will be required to yield a functional, real-time system.

RELATED SECTIONS

Section 13420 Process Control Instruments

Section 13450 Functional Description

Section 16780 Radio Modems

SUBMITTALS

The City of Morgan Hill has selected the following programming firms based on their experience and familiarity with the Town's PLC and SCADA systems. The following integrator shall be hired for all project PLC and SCADA programming:

Tesco Controls Incorporated, Sacramento, CA. Office

Make submittals for all materials, hardware, and software to be provided under this Section, whether as specified or substitutions, in accordance with general specifications.

Submit a preliminary description of the SCADA workstation display screens to be provided, including a preliminary description or listing of the contents of each. Include a diagram or map that depicts the hierarchical relationship between the display screens, and an indication of how the operator may navigate from one screen to the next. Submit a hardcopy printout of two representative graphical display screens.

CLOSE-OUT SUBMITTALS

A User's Guide or Operator's Manual describing the intended use of the site-specific programming specified herein.

Documentation and electronic program backup copies of all site-specific programming provided under this Section for all PLCs and SCADA systems, including "as-built" control logic descriptions, annotated program listings, and ladder-logic diagrams.

A system configuration diagram showing all PLCs and their identification tags, local and remote I/O and the logical addresses associated with each physical device, network devices and interfaces, and the description of all interconnecting cables including connectors and pin-outs.

I/O schematics depicting the signal and control connections of all controlled devices and instruments.

Upon request, the Engineer will provide electronic media copies of contract documents to facilitate the preparation of these closeout submittals. Electronic media copies will be provided in their existing formats.

QUALITY ASSURANCE

SCADA programming and integration performed under this Section shall be by an integrator who has been regularly engaged in control integration of water treatment plants.

All equipment furnished or modified under this Section shall be of a manufacturer who has been regularly engaged in the design and manufacture of the equipment.

The integrator's trained field representative shall have the following experience requirements:

Have overseen the integration of control systems for not less than five wells

Have overseen the programming of at least five control systems using the same human-machine interface (HMI) software supplied for this Project, in the same or earlier versions of the software.

A complete factory acceptance test shall be performed at the integrators facility simulating all inputs with switches and 4-20 ma sources, control functionality of all equipment and alarms. A minimum of two (2) weeks advance notice will be provided for scheduling this test. The integrator will make all control screen and control modifications required by the engineer as a result of this test as part of this contract.

SCHEDULING

Scheduling and coordination of Work under this section shall as required by owner.

WARRANTY

The manufacturer shall provide a one-year labor and parts warranty on the system. Warranties shall start on the date of filing of the "Notice of Completion."

MAINTENANCE

Contractor shall provide twenty (20) hours of telephone-based and eight (8) hours of on-site support and maintenance (separate from warranty) during the first year of service after the "Notice of Completion." Additional support and maintenance required shall be available at the Contractor's standard rates.

GENERAL CONTROL LOGIC REQUIREMENTS

Additional System functions:

High Pressure Switch shutoff

Pressure transmission on station piping

Pump Control valve limit switch

Flow transmitter

Motor runtime and flowmeter monitoring page/report (totalizer, current, and last 24 hours).

Power monitoring.

4-20 ma and discrete output control of all pump VFD's.

Alarms

Operational alarms generated during operation of the water system shall be classified as follows:

Critical or High Level 1 Alarm—Individual Specific Process Shut Down. All processes and systems in the individual plant (Filters A, B, C) generating the alarm condition shall be terminated. HMI software shall display an alarm notice. Plant operator shall be notified via the alarm dialer. Affected treatment plant shall not restart until the operator has cleared the alarm notice and the operational parameter that gave rise to the alarm has returned to normal values.

Medium Level 2 Alarm—Dialer Notification. Plant operator shall be notified via the alarm dialer. Processes and systems associated with the alarm condition shall be allowed to continue. HMI software shall display an alarm notice that will remain until cleared by the operator.

Low Level 3 Alarm—Screen Notification. HMI software shall display an alarm notice that will remain until cleared by the operator.

Alarm log.

All alarm events shall be logged. Alarm log entries shall include as a minimum: date-time stamp, status (active/inactive & acknowledged/unacknowledged), description of alarm, and identification of device generating the alarm and alarm level. Alarm clearance entries shall also include the login name of the operator who cleared the alarm.

Security

The site-specific control programs shall provide a minimum of four levels of security, as follows. Except as noted, all security levels require a username and password in order to log onto and access the system.

Level 1 Security—Programmer. Provides full access to all control programs, control objects, databases, and all other development resources in addition to the privileges of Level 2.

Level 2 Security—Supervisor. In addition to the privileges of Level 3, Supervisor access allows modification of allowable set point ranges, and can establish equipment and operational state locks including which set points are level 3 that cannot be modified at less secure levels. Supervisor access is required to create new or modify existing reports.

Level 3 Security—Operator. This security level represents the level of operational and data control routinely used in day-to-day operation. All data can be reviewed, equipment operational states changed, set points redefined within allowable ranges, and reports and be requested and printed.

Level 4 Security—Observer. This is the default security level, and requires no username or password. Provides view- and read-only access to displays and operational state data. No changes in operational state of equipment, set points, or other operational or software properties are allowed.

PLC AND HMI SCADA WORKSTATION DISPLAY SCREENS

General

As used in this topic, the term "display screen" refers to graphical and alphanumeric displays of data presented on the SCADA workstation monitor. Display screens are generated and controlled by the human-machine interface software.

As used in this topic, the term "interactive display screen" refers to a display screen that includes controls, on-screen function keys, icons, or other features that allow the operator to interact with the data and change the operational status of displayed information, equipment, and controlled devices.

Interactive display screens shall be provided to communicate and control the status of all equipment, systems, and devices controlled by or in communication with the plant SCADA system. Display screens shall also be provided for all alarms, alarm logs, and operator set points. Data trend displays shall be available for time series data.

Interactive display screens with standard key/format for (set points, command signal, feedback signal, operational state on, off/ready, offline, hand, local, remote, fail, etc.) that report operational status information about physical equipment or systems shall be graphical in nature. Each item of equipment, including pumps, valves, tanks, etc., shall be shown in a symbolic manner. Piping that is significant to the function of the device or system shall also be shown. The operational state of each device (open, closed, on, auto, hand, off, alarm condition, malfunction, etc.) shall be displayed through use of color, differences in the symbol used, annotation, or other visual manner. Analog data such as tank levels shall be shown both in a graphical format and numerically.

Status logs, alarm logs, time series data, and other tabular data may be presented in alphanumeric displays. Such displays may be provided to present greater quantities of information than can conveniently be displayed in a schematic graphical representation, or to permit the sortable information to be sorted or filtered by operator established criteria. Default plus order: newest on top.

Information shall be presented in a hierarchical manner, with initial screens displaying broad, summary information, and more detailed and more closely focused information displayed in subsequent screens. The operator shall be able to navigate between screens using Forward and Back controls, querying display objects visible on the screen, & accessing a display screen index, if useability is hampered then a combination of these methods. Navigation between screens shall be fully managed within the HMI software environment, requiring no operating-system level commands or actions.

See existing screen shots for the minimum number of screens to be provided. This specification lists additional screens to be developed.

System Overview Display.

A system overview screen shall be interactive and shall show:

Good site information including on/off status and flow rates.

Intrusion alarms.

OPERATOR INTERFACE DEVICE DISPLAYS

General.

Operator interface devices shall be provided and programmed to provide data access to and control of each of the devices, systems, processes, and set points under automated control at the site where it is located.

Each operator interface shall be able to operate autonomously, communicating with and controlling the associated PLC without benefit of the SCADA workstation.

Information shall be presented in a hierarchical manner, with initial displays providing summary data and subsequent displays providing more detailed and more closely focused data. The operator shall be able to navigate between displays using function keys or other means.

REQUIRED REPORTS

General.

The information management portion of the plant control software shall provide the capability to generate predefined and ad hoc reports based on accumulated operational data. The software shall provide the capability to query and filter the data on multiple criteria, including filtering for the sampling frequency of data.

Software shall include the necessary tools for creation of new reports, and documentation on the use of these tools.

Trends shall be programmed for all process variables and run states of equipment.

Monthly Treatment Plant Report

The Monthly Treatment Plant report is a tabular report with the following columns of data, with a row of data for each calendar day. Summary totals, averages, maximum, and minimum values shall be provided where indicated.

Parameter	Total	Ave.	Max.	Min.	Notes
Date					
Power consumption and KW/Gal					
Well 1 Flow Meter Reading & Run timer	●	●	●	●	

Manually entered data.

Daily average.

Daily minimum.

3. Two additional reports of similar scope and complexity shall be provided at the direction of the Engineer.

   a. Well 1 Raw Water Total Runtime, Average Runtime, Maximum Minimum Runtime.

   b. Filter 1 Water Total Runtime, Average Runtime, Maximum Minimum Runtime.

   c. Manually-entered Date.

PRODUCTS

PROGRAMMABLE LOGIC CONTROLLERS (PLCs)

The programmable controllers shall consist of a central processor, process controller, memory, input/output, interconnecting cables, and optional items as required for a complete and operable system and as specified. The system shall be modular in design, with the central processor, communications, and I/O contained in modules that insert into a common chassis. PLC shall have direct communication interface to the variable speed drives for monitoring not control.

Manufacturer and model shall be Tesco L3000 with integral operator interface per drawings. No exceptions without owner approval.

ETHERNET SWITCH

The Ethernet switch shall have 10/100 Base T fast Ethernet ports. Fully managed features for MAC-based port security, secure web (HTTP/SSL) and Telnet (SSH), ND IEEE 802.1x with RADIUS remote server authentication.

Manufacturer and model shall be Red Lion Sixnet SLX MS, number of ports per drawings, or equal.

UNINTERRUPTIBLE POWER SUPPLIES (UPS)

The UPS shall have these features at a minimum: cold start capability providing battery power when the utility is out, dataline surge protection, hot swappable batteries, LED status display, automatic self-test of batteries, and intelligent battery management. A relay bypass circuit shall be provided so if the UPS fails utility power will still be provided.

Manufacturer and model shall be APC Back-UPS or equal.

SCADA WORKSTATION

Modify the existing SCADA workstation and add memory as needed to incorporate new controls.

Software

1. Tag/Alarm database: Update the database for East Main Well #1.

SOFTWARE OWNERSHIP

SCADA Source Code shall be provided to and owned by the City of Morgan Hillin an electronic backup media format.

PLC Logic code and program listings with descriptors shall be provided to and owned by the City of Morgan Hill in an electronic backup media format.

EXECUTION

INSTALLATION

Installation of programmable logic controllers, I/O components, network devices, and other hardware specified in this section shall be installed in accordance with manufacturer's instructions.

Contractor shall provide all equipment, connections, and appurtenances for a complete and operational system.

FIELD QUALITY CONTROL

Contractor's field service.

The Contractor shall provide the service of a qualified representative to provide instructions on the proper installation of the equipment, inspect the completed installation, participate in the startup of equipment controlled by the PLC-based control system, participate in the field testing of the plant control and SCADA systems and make any necessary adjustments and program changes, conduct training of the Owner's personnel as described below, and place the plant control and SCADA systems in trouble-free operation. The contract price paid for the plant control and SCADA systems shall include the cost of these services.

Operations review of as-built, two (2) weeks to request changes.

Installation supervision shall include sixteen (16) hours of inspection and field adjustments after project completion.

Training shall include eight (8) hours of instruction after project completion.

PLC I/O

See Drawings

PART 4 – MEASUREMENT AND PAYMENT

No separate payment will be made for Plant Control and SCADA. Payment for work in this section shall be included as part of the applicable Lump Sum or Unit Prices stated in other sections.

-END OF SECTION-

SECTION 15025 - PIPE (STATION, DISTRIBUTION AND DRAINAGE)

Bid Item No. 17

PART 1 – GENERAL

1.01 SCOPE

A. This section consists of furnishing and installing black steel pipe (BSP), polyvinyl chloride (PVC) pipe, ductile iron (DI) pipe, copper tubing, high density polyethylene pipe (HDPE), fittings, closure pieces, pipe supports, bolts, nuts, gaskets, thrust blocks and all associated appurtenances. Pipe types, lengths, and dimensions are indicated on the Drawings. No substitution or deviation from Drawings will be allowed.

B. All materials, labor and workmanship associated with the installation of the piping shall conform to the Drawings and Specifications and applicable AWWA, ASTM, Santa Clara County and to the Improvement Standards and Technical Specifications of the City. Copies of the subject standards are available from the City.

C. Certification with NSF Standard 61 shall be provided by the National Sanitation Foundation for all new piping related appurtenances used in the production or distribution of drinking water in contact with drinking water including contact with raw water to be treated.

D. Do not prepare any shop drawings for, or make final order for, or design any pipe materials for any particular section of pipeline, until all utilities that are to remain in that section of pipeline have been exposed.

1.02 RELATED WORK

A. SECTION 02300 - EARTHWORK

B. SECTION 02320 - TRENCH EXCAVATION AND BACKFILL

C. SECTION 03300 - CONCRETE

1.03 SUBMITTALS

A. Prior to the start of manufacturing, the following shall be submitted to, and approved by the Engineer:

1. **Shop Drawings**
   The Contractor shall submit complete data on pipe, fittings, linings, coatings, and any manufacturer's installation instructions showing conformance with the applicable standard.

Shop drawings shall include a laying plan showing the location of each pipe section and each special length with each piece numbered or otherwise designated in sequence. Laying plans shall be submitted for all welded steel and ductile iron pipe and underground PVC pipe. All outlets and bends shall be installed where located on the Drawings unless otherwise approved.

2. **Certification**
   Certification properly executed by the manufacturer shall be furnished to the Engineer showing compliance to the required Specifications and applicable standards. Test data on tests performed shall be provided as requested by the Engineer.

1.04 HANDLING, STORAGE AND SHIPPING

A. Coated pipe shall be shipped on bunks, and secured with nylon belt tied down straps or padded banding located approximately over braces. Coated pipe shall be stored on padded skids, sand or dirt berms, sand bags, old tires or other suitable means so that coating will not be damaged. Coated pipe shall be handled with the wide belt slings, padded forks, or other means that will not damage the pipe. Chains, cables or other equipment likely to cause damage to the pipe or coating shall not be used. Prior to shipment, the pipe shall be visually inspected for damage to the coating. Any damaged areas shall be repaired in accordance with the standard to which the coating was applied.

B. Pipe that shows evidence of exposure to sunlight, age, surface deterioration, or other physical damage is not acceptable. The decision of the Engineer shall be final as to the acceptability of the pipe to be installed. For pipe older than 24 months, the CIty will require information on the pipe storage during the period. The City reserves the right to reject pipe older than 24 months or to require retesting and recertification by the pipe manufacturer.

1.05 DESIGN PRESSURES

A. The design pressure of pipe shown on the Drawings or in these Specifications is the minimum required static internal design pressure in pounds per square inch. The pipe shall be designed for this internal pressure, for earth loads, and for an AASHTO H-20 wheel load, all without exceeding the allowable design stresses. Pipe shall be designed for earth and wheel load both with and without internal pressure. In addition, pipe shall be designed for the test pressure specified herein without exceeding 50 percent of yield stresses or joint design pressures.

B. Pipe shall be designed for 100 psi working pressure with an additional 50 psi allowance for surge.

C. All fittings, couplings, valves, and other appurtenances shall be rated for the same or a higher design pressure as the pipe they are used on and shall withstand the test pressure without

damage.

D. Provide thrust blocks or restrained joints at valves and fittings as shown or where not shown as necessary to prevent the movement or deflection of the pipe when under pressure. Thrust restraint design pressure shall be 200% of the pipe design pressure, or the test pressure, whichever is greater.

1.06 PIPE DIAMETERS

A. The pipe diameters shown on the Drawings and used in these Specifications are inside diameters unless specific reference is made to outside diameter of the pipe or the pipe is a standardized product normally designated by a nominal size, e.g., ductile iron pipe.

1.07 MARKING AT PLANT

A. Each pipe and fitting shall be marked at the plant. Marking shall include size or diameter and class of pipe or fittings, manufacturer's identification, and date of manufacture.

1.08 INSPECTION

A. All pipe may be subject to inspection at the place of manufacture in accordance with the provisions of the referenced standards as supplemented by the requirements herein. The Contractor shall notify the City in writing of the manufacturing starting date not less than 14 calendar days prior to the start of any phase of the pipe manufacture. In addition, the Contractor shall give the City three (3) working days advance notice of the start of any surface preparation or coating application work.

B. During the manufacture of the pipe, the City shall be given access to all areas where manufacturing is in process and shall be permitted to make all inspections necessary to confirm compliance with the Specifications. Material, fabricated parts, and pipe that are discovered to be defective, or that do not conform to the requirements of this Specification, will be subject to rejection at any time prior to final acceptance of the pipe.

PART 2 – MATERIALS

2.01 PIPE

A. Pipe used in the construction of the water distribution systems shall be of the type shown on the Drawings. It shall be the regular product of a manufacturer who is fully experienced, reputable, and qualified in the manufacture of the materials to be furnished and has successfully manufactured comparable pipe for at least three (3) years.

1. Black Steel Pipe (under 6 inch diameter)

Black steel piping shall conform to the requirements of ASTM A53, Schedule 40 and shall be Grade B. Butt-welded flanged fittings shall conform to ASME B16.5.

2. **Stainless Steel Pipe**
   All stainless steel pipe shall be type 304/304L or as indicated on the Drawings. Pipe shall have welded construction with exception of 1/8" to 3/8" pipe sizes which shall be seamless. Pipe shall meet ASTM A733, ASTM A312, and ANSI/ASME B1.20.1.

3. **Galvanized Steel Pipe**
   Galvanized steel pipe shall conform to the requirements of ASTM A53, Schedule 40 and shall be Grade B.

4. **Black Steel Pipe (6 inch diameter and larger)**
   Steel pipe shall be designed in accordance with AWWA M11. Steel pipe shall be manufactured of steel plate of the thickness shown on the Drawings. Where not shown, the thickness shall be not less than 3/16 of an inch for pipe 24 inches in diameter and smaller, and not less than 1/4 of an inch for larger sizes unless otherwise approved by the Engineer.

   Pipe materials, fabrication, and shop testing of straight pipe shall conform to the requirements of the "AWWA Standard for Steel Water Pipe 6 Inches and Larger" (AWWA C200). All outlets, 4 inches in diameter and larger, shall be provided with reinforcing designed for the water working pressure specified or shown. For pipe 14 inches in diameter and larger, the inside diameter after lining shall be not less than the nominal diameter specified or shown. Pipe smaller than 14 inches in diameter may be furnished in standard outside diameters.

   a. **Cement Mortar Lining of Steel Pipe**
      Except as otherwise required, interior surfaces of all steel pipe, fittings, and specials shall be cleaned and lined in the shop with cement-mortar lining applied centrifugally in conformity with AWWA C205. The minimum lining thickness shall be in accordance with AWWA C200, Table 1 of Section 4.

      Mortar lining material shall be certified to NSF Standard 61 of the National Sanitation Foundation for all linings in contact with drinking water including contact with raw water to be treated.

      The progress of the application of mortar lining shall be regulated in order that all hand work, including the repair of defective areas is cured in accordance with the provisions of AWWA C205.

      During the lining operation and thereafter, the pipe shall be maintained in a round condition by suitable bracing or strutting. The pipe shall be left bare where field joints occur as indicated. Ends of the linings shall be left square and uniform. Feathered or

uneven edges will not be permitted.

If lining is damaged or found faulty at delivery site, the damaged or unsatisfactory portions shall be replaced with lining conforming to these Specifications at no additional cost to the City.

Defective linings, as determined by the City, shall be removed from the pipe wall and shall be replaced to the full thickness required. Defective linings shall be cut back to a square shoulder in order to avoid feathered edged joints.

Cement-mortar for patching shall be the same materials as the mortar for machine lining, except that a finer grading of sand and mortar richer in cement shall be used when field inspection indicates that such mix will improve the finished lining of the pipe.

For all pipe and fittings with plant-applied cement-mortar linings, the pipe manufacturer shall provide a polyethylene or other suitable bulkhead on the ends of the pipe and on all special openings to prevent drying out of the lining. All bulkheads shall be substantial enough to remain intact during shipping and storage until the pipe is installed.

The materials and design of field application of cement-mortar lining shall be in accordance with AWWA C602 and the following supplementary requirements.

1. Portland cement shall conform to Type II, ASTM C150.

2. Pozzolanic material shall not be used in the mortar mix.

3. Admixtures shall contain no calcium chloride.

4. The minimum lining thickness shall be as indicated for shop-applied cement-mortar lining and the finished inside diameter after lining shall be as shown.

b. Cement Mortar Coating of Steel Pipe

The exterior surfaces of pipe which will be exposed to the atmosphere inside structures or above ground shall be thoroughly cleaned and then given a shop coat of rust-inhibitive primer and a finish coat conforming to the requirements of SECTION 09900 – PAINTING.

All pipe for buried service, including bumped heads, shall be coated with a 1- inch minimum thickness of reinforced cement-mortar coating.

Exterior surfaces of pipe or fittings passing through structure walls shall be cement-mortar coated six (6) inches beyond the inside wall face.

Unless otherwise specified, the reinforcement for the coating of pipe sections may be spiral wire, wire fabric, or wire mesh in accordance with AWWA C205.

The welded wire fabric shall be securely fastened to the pipe with welded clips or strips of steel.

The wire spaced 2 inches on centers shall extend circumferentially around the pipe. The ends of reinforcement strips shall be lapped 4 inches and the free ends tied or looped to assure continuity of the reinforcement.

c. Fusion Epoxy Lined and Coated Steel Pipe

All above ground black steel pipe, fittings and flanges shall be lined and coated with a fusion-bonded epoxy conforming to AWWA C213 and SECTION 09900 - PAINTING. Field application and repair of fusion bonded epoxy lined and coated pipe shall be performed in accordance with SECTION 09900 - PAINTING.

5. Ductile Iron Pipe (DIP)

Ductile iron pipe furnished in diameters four inches (4") through twenty-four inches (24") shall be manufactured in accordance with AWWA C151 with single rubber gasket joints in accordance with AWWA C111. Where shown on the Drawings, flanged ductile iron pipe shall be manufactured in accordance AWWA C115. Laying length shall be the manufacturer's standard length, not to exceed 20 feet. Shorter lengths may be used when required for closures and proper location of special sections. Four inch (4") diameter pipe shall be Class 51 wall thickness, and six inch (6") through twenty-four inch (24") diameter pipe shall be Class 50 wall thickness in accordance with ANSI A21.50 (AWWA C150), unless otherwise specified or shown on the plans. Ductile iron castings shall conform and be tested in accordance with ASTM A536. Casting grade for pipe shall be 60-42-10.

6. Polyvinyl Chloride Pipe (PVC)

a. SDR-26 PVC

All SDR-26 PVC sewer pipe shall be made from clean, virgin, Type 1, Grade l, PVC conforming to ASTM D1784. SDR-26 PVC pipe shall conform to the latest revision of ASTM D3034 for diameters from 4 inches to 15 inches and the latest revision of ASTM F679 for 18 inches to 48 inches. Rubber gaskets shall be factory installed and conform to ASTM F477. Pipe joints shall be integral bell gasket joints conforming to ASTM D3212. Pipe and fittings must be assembled with a non-toxic lubricant. Four inch and six inch diameter pipe may be the solvent weld type provided an expansion joint is provided if the length of run exceeds 100 lineal feet. All pipe shall be 20 feet or less in length. The pipe shall be US manufactured by Johns-Manville, JM Eagle, Certainteed, PW Pipe, or approved equal.

b. Schedule 40 PVC

Schedule 40 PVC pipe in sizes ½-inch to 8-inches shall conform to the latest revision of ASTM D1785, ASTM D2467 and ASTM D2665. The PVC pipe shall be manufactured in sections not to exceed 20-feet in length. The Contractor shall use either solvent weld or gasketed bell and spigot pipe. Pipe and couplings shall be US manufactured by Johns-Manville, Certainteed, or approved equal.

c. Schedule 80 PVC

Schedule 80 PVC pipe in sizes ½-inch to 8-inches shall conform to the latest revision of ASTM D1785, ASTM D2467 and ASTM D2665. The PVC pipe shall be manufactured in sections not to exceed 20-feet in length. The Contractor shall use either solvent weld or gasketed bell and spigot pipe. Pipe and couplings shall be US manufactured by Johns-Manville, Certainteed, or approved equal.

d. Chlorinated PVC (CPVC)

CPVC pipe and fittings shall conform to ASTM D2846 and ASTM D1784 and be Schedule 40. Pipe and fittings shall be manufactured as a system and be the product of one manufacturer. Solvent cement joints shall be made in a two step process with primer manufactured for thermoplastic piping systems and solvent cement conforming to ASTM F493.

7. Brass Pipe and Fittings

Brass pipe and fittings shall be lead free, conform to ASTM A43 and be minimum class 150 psi.

8. Copper Tubing

Copper tubing for use in underground water service shall be continuous-run (no joints) Type K soft copper tubing. Copper tubing for use in interior water service shall be Type K hard copper tubing and compression or lead-free solder sweat connections. Pipe shall conform to the latest revisions of AWWA C800, ASME B31, and ASTM B88. Copper pipe shall be Mueller Streamline with Poly Coat.

2.02 FITTINGS, JOINTS AND COUPLINGS

A. PVC Bell and Spigot Fittings

Socket or bell-and-spigot type PVC fittings shall be standard commercial products fabricated by molding or by extrusion and machining and shall conform to the requirements of ASTM D2241 and these Specifications. The manufacture of the fittings shall be in accordance with good commercial practice so as to produce fittings compatible with the type of PVC pipe furnished. Dimensions and tolerances of fitting joints shall conform to the tolerances of the PVC pipe furnished. The minimum burst strength of the fittings shall be not less than that of the adjacent pipe.

B. Ductile and Cast Iron Fittings

Fittings shall be of cast-iron conforming to the requirements AWWA C110. Joints between PVC pipe and cast-iron valves or fittings shall be mechanical joint or approved equal. AWWA C153 compact fittings may also be used as an approved equal. Fittings shall be of a class at least equal to that of the adjacent pipe.

C. Black Steel Fittings

Fabricated fittings shall be made up of steel pipe, conforming to ASTM A53, 35,000 psi minimum yield strength, ¼ inch wall, except 20-inch diameter through 24-inch diameter, which shall be 3/8-inch wall. Welding fittings shall be seamless steel conforming to ASTM A234.

D. Stainless Steel Fittings

Stainless steel fittings shall be made up of type 304/304L stainless steel unless otherwise indicated by the Drawings. Fittings shall conform to ANSI/MSS SP-114 (for heat treating, material thickness, and marking) and ASTM A351, except hex-socket plugs.

E. Brass Fittings

Brass fittings shall be lead free and meet ASTM B584 or B927, as well as ANSI/ASME B16.15 and B1.20.1.

F. Flanged Coupling Adapters

Flanged coupling adapters shall be wrought steel or cast iron capable of withstanding the designated internal pressure without leakage or overstressing. Diameter of the coupling shall be compatible with the outside diameter of the pipe on which the coupling is installed. Furnish all joint accessories with couplings. Verify dimensions of all existing pipelines in the field before ordering couplings.

Steel style flanged couplings shall consist of a steel body, steel or malleable iron follower rings, and steel bolts. Steel flanged coupling shall be as manufactured by Rockwell International, Inc.; Dresser Manufacturing Division of Dresser Industries, Inc.; or equal.

Cast style flexible coupling shall consist of a cast iron middle ring, malleable iron follower rings, and steel bolts. Cast flexible couplings shall be as manufactured by Rockwell International, Inc.; Dresser manufacturing Division of Dresser Industries, Inc.; Romac Industries, Inc.; or equal.

G. Flexible Couplings

Flexible couplings for use with steel pipe shall be Dresser, Style 38; Rockwell, Style 411; or equal. Flexible couplings for use with ductile iron pipe shall be Dresser, Style 53, 153, or 38; Rockwell, Style 431; or equal. Steel middle rings shall be pressure tested beyond the yield point. Verify dimensions of all existing pipe.

Cast style flexible coupling shall consist of a cast iron middle ring, malleable iron follower rings, and steel bolts. Cast flexible couplings shall be as manufactured by Rockwell International, Inc.; Dresser manufacturing Division of Dresser Industries, Inc.; Romac Industries, Inc.; or equal.

J. Transition Couplings and Expansion Joints

Flexible transition couplings shall be bolted, with ductile iron sleeve and end rings, Ford Model 501, Dresser No. 153, or Rockwell No. 431. Flexible expansion joints shall have fully molded arches. Diameter of the coupling shall be compatible with the outside diameter of the pipe on which the coupling is installed. Furnish all joint accessories with Flexible Couplings.

H. Reinforced Concrete Pipe Fittings

Fittings and specials for reinforced concrete pipe shall be shop fabricated. Fittings and specials shall be designed for the same internal and external pressures as the adjoining pipe or as shown. Fabrication details shall be submitted to the Engineer for review prior to the manufacture of fittings and specials.

Fittings may be fabricated from steel plate cement mortar-lined and coated, or from mitered end concrete pipe provided the maximum angle of any miter is 10 degrees (maximum 20-degree bend). Steel plate fittings shall conform to the dimensional requirements of AWWA C208, Table 2. Steel plate thickness shall be 3/16-inch minimum. Steel fittings shall be lined and coated in accordance with AWWA C205. Bell adapters shall be fabricated from steel plate and shall be accurately dimensioned for a rubber gasket joint. Mitered end concrete pipe fittings will be allowed only for A-25, B-25, and C-25 reinforced concrete pipe. All other classes of reinforced concrete pipe will require steel fittings as specified.

I. Mechanical Joint Restraints

Restraint devices for mechanical joint fittings and appurtenances shall conform to either ANSI/AWWA C111/A21.11 or ANSI/AWWA C153/A21.53 and the following:

1. Restraint devices for nominal pipe sizes 3 inch through 48 inch shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10.

2. The devices shall have a working pressure rating of 350 psi for 3-16 inch and 250 psi for 18-48 inch. Ratings are for water pressure and must include a minimum safety factor of 2 to 1 in all sizes.

Gland body wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536. Restraint devices shall be Listed by Underwriters Laboratories (3" through 24" inch size) and Approved by Factory Mutual (3" through 12" inch size). Mechanical joint restraint shall be Megalug Series 1100 produced by EBAA Iron Inc. or approved equal.

L. Flanges

Flanges shall have flat faces. Pipe flanges shall be attached with bolt holes straddling the vertical axis of the pipe unless otherwise shown. All flanges shall conform to AWWA C207 and the following requirements:

Flanges shall be Class D for pressures to 175 psi on 4 inch through 12-inch diameter, and 150 psi on diameters over 12 inches.

M. Gaskets

Flange gaskets shall be full-faced, in accordance with applicable parts of ANSI B16.21 and AWWA C207, as last amended. Gaskets shall have holes to pass bolts, and be free from corrosive alkali or acid ingredients. Segmented straight-joint or interlocking gaskets will not be accepted. Gaskets shall be BLUE-GARD Style 3000 or approved equal.

N. Nuts, Bolts and Washers

Nuts, bolts and washers shall conform to AWWA C207 the sizes and quantities recommended in Section 2 of AWWA C207. Bolts shall be threaded to conform to ANSI B1.1, Class 2A coarse threads.

Nuts, bolts, and washers shall be Class 2, type 316 stainless steel and conform to ASTM A194 Grade B8M, ASTM A193 Grade B8M, and ASTM F436 respectively.

2.03 APPURTENANCES

A. Service Saddles

Bronze bodied saddles with a wide single stainless steel strap or full circle body clamp d ouble bolted to each side of the saddle shall be used on pipe sizes 6 inch through 12 inch. The saddle body shall be manufactured from cast bronze in accordance with ASTM B62 or B584 and AWWA C800. The single strap shall have double bolts on each end of the strap to connect it to the bronze saddle. The ears of the strap shall turn inward and rest against the inside of the strap. The gasket shall be Buna N. The saddle shall be threaded with 1 inch or 2 inch iron pipe threads.

A fabricated two part carbon steel saddle shall be used for wet tap connections. The carbon steel used in the saddle shall have a minimum yield strength of 30,000 psi. The bolts and nuts shall be stainless steel, Type 316.The entire sleeve shall be shop coated with a minim um of 8 mils of fusion bonded powder epoxy in accordance with AWWA C213.

No wet taps will be allowed where the outlet is the same size as the main.

Fabricated steel and cast iron saddles shall have a minimum ½ inch welded thread-o-let or 3000 lb. half-coupling for testing.

Brass saddles shall not be used.

B. Butyl Rubber Tape Wrap

Tape wrap shall be 15 mil butyl rubber adhesive, polyethylene-backed tape as produced by Polyken Division of the Kendall Company, Boston, MA; Royston Laboratories, Inc., Pittsburgh, PA; or equal.

C. Joint Lubricant

Furnish joint lubricant with the pipe. Furnish the amount and type recommended by the pipe manufacturer. The lubricant for water pipes shall be a water-soluble, nontoxic, vegetable soap compound conforming to United States Pharmacopeoia No. P39.

D. Feeler Gauge

Furnish sufficient feeler gauges of the proper size, type, and shape for use during installation to check the rubber gaskets.

E. Concrete for Thrust Blocks and Concrete Encasement

Concrete shall conform to SECTION 03300 - CONCRETE.

F. Adjustable Pipe Support

Adjustable pipe supports shall be 3-inch diameter stand with 2 ½ -inch pipe diameter pipe supports, and yolk as shown on the Drawings. All exposed pipe support material/parts shall be constructed from galvanized steel. Pipe supports shall be Pipeline Products Model PS-S or approved equal.

G. Flange Insulation Kits

Provide flange insulation kits consisting of:

1. **Insulating Gaskets**
   Gaskets shall be fullfaced, 1/8-inch minimum thickness, and laminated phenolic with neoprene gaskets on each side. Insulating gaskets shall be Johns-Manville No. 71 dielectric sheet packing, Raybestos-Manhattan No. 73, or equal.

2. **Insulating Stud Sleeves for Each Bolt**
   Sleeves shall be a high-density polyethylene or spiral wrapped mylar.

3. **Insulating Washers for Each Bolt**
   Washers shall be 1/8-inch thick phenolic.

4. **Steel Washers Over Each Insulating Washer**
   1/8-inch thick cadmium plated. One-piece molded acetal resin, combination sleeve and washers are acceptable.

2.04 LOCATING WIRE

A. Where called for on the Drawings, locating wire shall be No. 10 A.W.G. insulated copper wire. Insulation shall be 1/16-inch PVC.

2.05 WARNING TAPE

A. Where called for in the Drawings, a non-detectable warning tape for the water line shall consist of a nominal 4.0 mil (0.004") overall thickness of polyethylene film formulated to resist degradation due to acid and alkaline soils. The color of the water line tape shall be blue and in black bold letters printed "CAUTION - WATER LINE BELOW." The tape shall be Hytech Non-Detectable Tape provided by Northtown Company or equivalent.

2.06 POLYETHYLENE WRAP

A. All underground steel and ductile iron pipe and fittings shall be wrapped in polyethylene film. The polyethylene wrap shall be 8 mil minimum in thickness, group 2, linear low density, flat tube, virgin polyethylene film. The wrap shall meet or exceed the requirements of AWWA C105. The film shall be marked showing trademark, year of manufacture, type of resin, specification conformance applicable pipe sizes and the words “warning corrosion protection – repair any damage.”

PART 3 - EXECUTION

3.01 TRENCH EXCAVATION AND BACKFILL

A. Refer to the requirements of SECTION 02320 - TRENCH EXCAVATION AND BACKFILL.

3.02 PREPARATION AND HANDLING

A. All pipe, fittings, and appurtenances shall be installed in accordance with the manufacturer’s recommendations and according to accepted water works practice. Each section of pipe and each fitting shall be thoroughly cleaned out before it is installed. All pipe, fittings, and appurtenances, shall be carefully lowered into the trench by suitable tools or equipment in such a manner as to prevent any damage, particularly to the lining and coating. When required by the City, approved slings shall be used to lower the pipe. Under no circumstances shall pipe or accessories be dropped into a trench. All pipe, fittings and appurtenances, shall be examined for defects before lowering into the trench. Any defective, damaged, or unsound materials shall be rejected.

3.03 DIRECTION OF LAYING

A. On slopes of 10 percent or less, the pipe may be laid in either direction on the slope. On slopes exceeding 10 percent, the pipes shall be laid in the uphill direction, unless otherwise permitted

by the Engineer. For pipes with push-on joints, the bell end shall normally face the direction of laying.

3.04 ALIGNMENT

A. Pipelines intended to be straight shall be so laid, and in no case shall deviation from a straight line exceed 0.30 foot for line and 0.10 foot for grade from the line and grade shown on the Drawings. Where pipelines are to be laid on a curve by means of unsymmetrical closure of spigot into bell, the pipe may be deflected at the joints. Under no circumstances shall the deflection exceed the maximum allowable as recommended by the pipe manufacturer. At no time shall horizontal or vertical deflections be achieved by pulling the pipe.

B. Where horizontal or vertical curves are shown in the alignment which cannot be installed by joint deflection of standard pipe lengths, the Contractor with the Engineer's approval, may select from the following options:

   1. Use shorter pipe lengths and allowable joint deflection as specified.

   2. Use special mitered joints.

   3. Use standard or special fabricated bends.

   4. Use high deflection couplings.

C. If alternates two or three are used, thrust blocking may be required. If the Engineer determines that thrust blocking is necessary, it shall be furnished at no additional cost to the City.

3.05 LAYING AND JOINTING PIPE AND FITTINGS

A. Materials used in jointing pipe shall only be that furnished with the pipe or recommended by the manufacturer. Pipe laying shall proceed with the bell ends pointing upstream. After a selection of pipe has been lowered into the prepared trench, clean the end of the pipe to be joined, the inside of the joint, and the rubber ring immediately before joining the pipe. Make assembly of the joint in accordance with the recommendations of the manufacturer. Provide all special tools and appliances required for the jointing assembly.

B. The gasket position shall be checked with a feeler gauge, furnished by the pipe manufacturer, to assure proper seating. After the joint has been made, check pipe for alignment and grade. Apply sufficient pressure in making the joint to assure that the joint is "home," as defined in the standard installation instructions provided by the pipe manufacturer. To assure proper pipe alignment and joint makeup, place sufficient pipe zone material to secure the pipe from movement before the next joint is installed.

C. Take the necessary precautions required to prevent excavated or other foreign material from entering the pipe during the laying operation. At all times, when laying operations are not in progress, at the close of the day's work, or whenever the workers are absent from the job, close and block the open end of the last laid section of pipe to prevent entry of foreign material or creep of the gasketed joints.

D. Take all precautions necessary to prevent the "uplift" or floating of the line prior to the completion of the backfilling operation.

E. Flexible expansion joints shall be installed against full-face flanges on each side of joint to protect fitting from cracking.

F. The raised face on steel flanges must be removed for all connections to cast iron flanges.

3.06 UNSUITABLE CONDITIONS FOR LAYING PIPE

A. Do not lay pipe in water, or on an unstable trench bottom, or when in the opinion of the Engineer, trench conditions are unsuitable.

3.07 PIPE CUTTING

A. When necessary to cut pipe, it shall be neatly and squarely cut to length using methods recommended by the manufacturer. All field-cut PVC shall be beveled and lubricated before joining.

3.08 COPPER TRACING WIRE

A. All runs of non-metallic pipe shall have locating wire laid along the top of the pipe and at all valves and appurtenances and held in place with ties or hitches of the same kind of wire, except RCP pipe used for storm drains or overflow lines. The wire shall be stubbed up inside each valve box and be placed as shown in the Drawings. The ties or hitches shall be spaced not more than 20 feet apart. The copper wire is to be used in the future as a means of locating the pipe with an electronic-type pipe locator. The copper wire shall be brought to the surface in each valve box so a direct connection can be made to the electric pipe locator. Care shall be taken to insure no "open" circuits occur. Electrical wire nuts will be an acceptable method of connection. Such joints will be taped and coated to prevent corrosion from damaging connections. Splice tracing wire by stripping insulation and twisting bare copper wires together and soldering or electrical wire nuts may be used to form a permanent connection. Wrap connection with standard black electrical tape.

3.09 THRUST BLOCKS

A. All pipeline tees, plugs, caps, bends, and other locations where unbalanced forces exist shall be

thrust restrained as shown or specified.

B. Thrust blocks shall be installed such that the thrust block shall extend from the fitting to undisturbed soil, and shall be of such bearing area as to assure adequate resistance to the force to be encountered. Minimum size of thrust blocking shall be in accordance with the standard detail shown in the Drawings. The excavation configuration and soil conditions may require additional concrete. Additional concrete shall be furnished and installed as a part of the contract prices.

C. Thrust blocks shall be kept clear of the joints so that the pipe and fitting joints will be accessible for repairs, unless otherwise directed. Side forms shall be used to contain the concrete. The concrete shall be placed in accordance with SECTION 03300 - CONCRETE.

3.10 CONCRETE ENCASEMENT

A. Concrete encasement shall be installed as indicated on the Drawings. All pipe to be encased shall be suitably supported and blocked in proper position, and shall be anchored to prevent flotation.

B. Except for welded joint pipe, a flexible joint shall be provided within 18 inches and as shown on the Drawings, from the terminations of any concrete encasement.

3.11 DISCONTINUED PIPE LAYING

A. Whenever pipe laying is discontinued for an hour or more, the open end of all mains and fittings shall be closed with watertight plugs or bulkheads. The plug or bulkhead shall not be removed unless, or until, the trench is dry. Pipe shall not be laid when the condition of the trench or the weather is unsuitable.

3.12 BEVELED PIPE

A. Sections of pipe with one or both ends beveled may be used for curved alignment. Beveled pipe shall have a maximum deflection of five (5) degrees from a plane perpendicular to the pipe axis unless otherwise shown on the Drawings or approved by the Engineer.

3.13 WELDING

A. All hand welding shall be done by welders certified in accordance with the "AWWA Standard for Field Welding of Steel Water Pipe" (AWWA C206) and the provisions of AWS D1.1. Where exterior welds are performed, adequate space shall be provided for welding and inspection of the joints. No welding of ductile iron pipe is permitted.

3.14 CEMENT MORTAR COATING OF STEEL PIPE

A. The interior and exterior joint recesses shall be thoroughly wiped clean and all water, loose scale, dirt and other foreign material shall be removed from the inside surface of the pipe.

B. The cement for joint grout and mortar shall be portland cement acceptable under ASTM C150 and shall be of the same type used for the pipe coating.

C. After the pipe has been laid and after sufficient backfill has been placed between the joints to hold the pipe securely in place, the outside annular space between pipe sections shall be completely filled with grout formed by the use of polyethylene foam-lined fabric bands. The grout shall be composed of one part cement to not more than 2 parts sand, thoroughly mixed with water to a consistency of thick cream.

D. The grout space prior to filling shall be flushed with water so that the surface of the joint to be in contact with the grout will be thoroughly moistened when the grout is poured.

E. The joint shall be filled with grout by pouring from one side only, and shall be rodded with a wire or other flexible rod or vibrated so that the grout completely fills the joint recess by moving down one side of the pipe, around the bottom of the pipe and up the opposite side. Pouring and rodding the grout shall be continued to allow completion of the filling of the entire joint recess in one operation.

F. Grouting of the outside joint spaces shall be kept as close behind the laying of the pipe as possible except that in no case shall grouting be closer than 3 joints of the pipe being laid.

G. The grout bands or heavy-duty diapers shall be polyethylene foam-lined fabric with steel strapping of sufficient strength to hold the fresh mortar, resist rodding of the mortar and allow excess water to escape. The foam plastic shall be 100 percent closed cell, chemically inert, insoluble in water and resistant to acids, alkali and solvents. The fabric backing shall be cut and sewn into 9-inch wide strips with slots for the steel strapping on the outer edges. The polyethylene foam shall be cut into strips 6 inches wide and slit to a thickness of 1/4-inch which will expose a hollow or open cell surface on one side. The foam liner shall be attached to the fabric backing with the open or hollow cells facing toward the pipe. The foam strip shall cover the full interior circumference of the grout band with sufficient length to permit an 8-inch overlap of the foam at or near the top of the pipe joint. Splices to provide continuity of the material will be permitted. The polyethylene foam material shall be protected from direct sunlight. The polyethylene foam-lined grout band shall be centered over the joint space with approximately equal widths extending over each pipe end and securely attached to the pipe with steel straps. After filling the exterior joint space with cement grout, the flaps shall be closed and overlapped in a manner that fully encloses the grout with polyethylene foam. The grout band shall remain in position on the pipe joint.

3.15 CEMENT MORTAR LINING OF STEEL PIPE

A. After the backfill has been completed to final grade, the interior joint recess shall be filled with mortar of stiff consistency mixed in proportions of one part cement to 2 parts sand.

B. The mortar shall be tightly packed into the joint recess and troweled flush with the interior surface, and all excess shall be removed.

C. At no point shall there be an indentation or projection of the mortar exceeding 1/16-inch.

D. The interior lining of the CMLC pipe at field welded joints or bell and spigot joints shall be repaired by buttering the inside of the joint, pushing the pipe ends together, and then pulling a burlap wrapped ball through the joint which forces the mortar up into the joint creating a seamless mortar lining at the joint between the shop applied mortar lining of both pipe segments.

E. These joints shall be video-taped by the [Owner/City/District] or hand holes shall be provided at each joint, all at no additional cost to the [Owner/City/District].

F. The Contractor shall perform all work in a thorough and workmanlike manner by trained personnel, under the supervision of experienced personnel skilled in machine application of cement-mortar lining to pipelines of size comparable to this work.

G. Curing of the in-place cement-mortar lining shall be in accordance with AWWA C602.

H. The Contractor shall provide additional protective devices as required to ensure that the airtight covers, which maintain a moist condition in the pipeline, are not damaged.

I. Defective areas encompassing the full diameter of the pipe shall be replaced by machine wherever the length measured along the pipe centerline is greater than 5 feet; otherwise defective areas may be replaced by hand.

3.16 THREADED JOINTS

A. Threaded joints, for service connections, air release assemblies, etc., shall be made with Teflon Plumber's Tape.

3.17 REINFORCED CONCRETE PIPE JOINTS

A. Each joint shall be sealed to prevent leakage. Joints sealed with cement mortar or resilient materials, shall be sealed both inside and outside.

B. If cement mortar is used in sealing the joint, the sealed joint shall be protected and cured in a manner approved by the Engineer. If the sealing material will not adhere to the pipe, or if a portion of the outside of the joint is inaccessible, the Contractor shall use a "diaper" or other method approved by the Engineer to properly seal the joint.

C. Immediately prior to making a cement mortar joint, the tongue and inside of the groove shall be thoroughly wetted with clean water.

3.18 WARNING TAPE FOR WATER LINE

A. Non-detectable warning tape shall be placed on top of the twelve (12) inch backfill covering the water line.

3.19 PIPE HYDROSTATIC TESTING

A. All pipe and appurtenances shall be hydrostatically tested. See SECTION 15950 - PERFORMANCE TESTING AND FACILITY STARTUP for testing requirements.

PART 4 – MEASUREMENT AND PAYMENT

All work as specified herein, satisfactorily completed, shall be paid for on a Lump Sum basis as stated in **Bid Item Schedule** for the item listed below:

Bid Item No. 17 – PIPE (STATION, DISRIBUTION AND DRAINAGE)

-END OF SECTION-

SECTION 15110 - VALVES AND RELATED APPURTENANCES

Bid Item No. 18

PART 1 - GENERAL

1.01 SCOPE

A. This section covers the work necessary for furnishing and installing gate valves, check valves, corporation stops, ball valves, combination air/vacuum valves, valve boxes and all related appurtenances, complete.

B. Certification with NSF Standard 61 shall be provided by the National Sanitation Foundation for all new valving and related appurtenances used in the production or distribution of drinking water in contact with drinking water including contact with raw water to be treated.

1.02 SUBMITTALS

A. Complete specifications, data, and catalog cuts or drawings covering the items furnished under this section shall be submitted by the Contractor.

PART 2 - MATERIALS

2.01 GENERAL

A. The Contractor shall furnish and install all valves as shown and specified. All valves shall be designed for and have a working pressure class rating equal to or greater than the design pressure for the adjoining pipe. Valves shall be capable of withstanding the field test pressure of the connecting piping without damage. All valves of one type and class shall be provided by the same manufacturer.

B. Each valve body shall be shop tested under a test pressure equal to twice its design water-working pressure, by the manufacturer, unless otherwise specified.

2.02 GATE VALVES - 3 INCHES OR SMALLER

A. Gate valves 3-inches and smaller shall be ASTM B62 bronze-bodied, with integral seat and union-ring bonnet and copper-silicon bronze stems. Gate valves shall have solid bronze wedge discs with full-open ports and asbestos free packing. Gate valves shall be rated to a minimum of 150 psig working pressure. Gate valves shall be manufactured by Crane Valve, Nibco, Powell or an approved equal.

2.03 GATE VALVES - 4 INCHES OR LARGER

A. Gate valves shall fully comply with the latest revision of AWWA C509, and shall also be UL

listed and FM approved. Unless otherwise shown on the Drawings, valves shall be furnished with flanged, push-on or mechanical joints. The valves shall be warranted by the manufacturer against defects in materials or workmanship for a period of ten (10) years from the date of manufacture. The manufacturing facility for the valves must have current ISO certification. The valve shall have a minimum 150 psig working pressure. Valves shall be fully faced and drilled in accordance with ANSI Standards B16.1, Class 125.

B. The valve body, bonnet, stuffing box, and disc shall be composed of ASTM A126 Class B grey iron or ASTM A395 or A536 ductile iron. The body and bonnet shall also adhere to the minimum wall thickness as set forth in Table 2, section 4.3.1 of AWWA C509. Wall thickness less than those in Table 2 are not acceptable. The valve disc and guide lugs must be fully (100%) encapsulated in SBR ASTM D2000 rubber material. The valves shall have all internal and external ferrous surfaces coated with a fusion bonded thermosetting powder epoxy coating of 10 mils nominal thickness. The coating shall conform to AWWA C550.

C. Unless otherwise shown on the Drawings, valves for underground service shall be NRS (non-rising stem), provided with a 2" square operating nut and valves for aboveground service shall be OS&Y (outside screw & yoke) provided with a handwheel. Valves shall open counter-clockwise (CCW) and have an arrow cast on the operating nut or handwheel showing CCW opening direction. The valve stem shall be made of bronze ASTM B132 alloy C67600 bar stock material. The stem material shall provide a minimum 70,000 psi tensile strength with 15% elongation and yield strength of 30,000 psi. Valves with cast stems or two piece stem collars are not acceptable. The valves shall have bolts and nuts for the stuffing box and bonnet with one of the following compositions: Steel, ASTM A307, Grade B zinc plated, and Type 304 stainless steel, and Type 316 stainless steel. Gate valves shall be manufactured by Dresser, DeZurik, Clow, Mueller, Pratt, or approved equal.

2.04 CHECK VALVE

A. The check valve shall be rated to a minimum of 150 psig working pressure. Flanged valves shall be fully faced and drilled in accordance with ANSI Standards B16.1, Class 125. Check valves shall open to permit flow when the inlet pressure is greater than the discharge pressure. When the discharge pressure is greater the valve shall close drip tight to prevent return flow. Check valves shall be suitable for installation in horizontal or vertical orientation.

1. Diaphragm-Type

Check valves shall be self-contained, hydraulically operated, globe or angle pattern as indicated on the Drawings. The valve shall consist of three major components: the body, with seat installed; the cover, with bushings installed; and the diaphragm assembly. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating operating pressure from line pressure. Packing glands and/or stuffing boxes are not permitted and there shall be no pistons operating the main valve or pilot controls. Valve body and cover shall be of cast ductile iron. No fabrication or welding shall be used in the manufacturing process of the valve body. All necessary repairs and/or modifications other than replacement of the main valve body shall be made

possible without removing the valve from service.

The valve shall contain a resilient, synthetic rubber disc, having a rectangular cross-section contained on three and one-half sides by a disc retainer and forming a tight seal against a single removable seat insert. The disc guide shall be of the contoured type to permit smooth transition of flow and shall hold the disc firmly in place. The disc retainer shall be of a sturdy one-piece design capable of withstanding opening and closing shocks. It must have straight edge sides and a radius at the top edge to prevent excessive diaphragm wear as the diaphragm flexes across this surface.

The diaphragm assembly shall contain a non-magnetic 304 stainless steel stem of sufficient diameter to withstand the specified hydraulic pressures. It shall be fully guided at both ends and for the entire range of travel, in the cover by a removable bushing and in the valve by an integral bearing in the valve seat ring. No center guides shall be permitted. The stem shall be drilled and tapped in the cover end to receive and affix such accessories as may be necessary. The non-wicking, flexible, diaphragm shall consist of nylon fabric bonded with synthetic rubber compatible with the operating fluid. The diaphragm must withstand a Mullins Burst Test of a minimum 600 psi per layer of nylon fabric. It shall be tested 100,000 times to insure longevity. The diaphragm shall be fully supported in the valve body and cover by machined surfaces with radius edges to prevent excessive wear as the diaphragm flexes. The support must be no less than one-half of the total surface area of the diaphragm in either the fully open or fully closed position

The seat ring with integral bearing shall be a one-piece solid design and shall have a minimum of a 4 degree taper on the seating surface for a positive drip-tight shut off. The seat ring in 4” and smaller size valves shall be threaded into the body. The valve seat ring in 6” and larger sizes shall be retained by hex head bolts for ease of maintenance. The lower bearing of the valve stem shall be contained concentrically within the seat ring and be exposed to the flow on all sides to avoid deposits. Locating the valve body and cover shall be by a machined locating lip to insure proper alignment of the valve stem. Pinning of the cover to the valve body shall not be permitted.

The pilot control system shall permit independent adjustment of the opening and closing speeds of the main valve. A direct factory representative shall be made available for start-up service, inspection and necessary adjustments.

The diaphragm check valve shall be a model 81-02 as manufactured by Cla-Val or approved equal.

2.05 DEEP WELL PUMP CONTROL VALVE

A. The deep well pump control valve shall be designed for installation on the discharge of the deep well pump to eliminate starting and stopping surges caused by the pump. The pump is started and stopped with the valve in an open position.

B. The valve shall be hydraulically operated, single diaphragm-actuated, globe pattern. The main valve shall consist of two distinct operating chambers that are detachable and completely independent of the flow through the main valve body. The valve shall consist of four components: the body with seat installed, the power unit body with center bearing, the cover with bearings installed and the diaphragm assembly. The valve body, power unit body and cover shall be of cast material. No fabrication or welding shall be used in the manufacturing process. The diaphragm assembly shall be the only moving part and shall form a seal between the two operating chambers. The stainless steel valve stem shall be guided by two bearings located in the cover and the power unit body. Packing glands and/or stuffing boxes are not permitted. There shall be no pistons operating the main valve or pilot controls.

C. The valve shall contain a resilient, synthetic rubber disc, with a rectangular cross-section contained on three and one-half sides by a disc retainer and forming a tight seal against a single removable seat insert. No O-ring type discs (circular, square, or quad type) shall be permitted as the seating surface.

D. The disc guide shall be of the contoured type to permit smooth transition of flow and shall hold the disc firmly in place. The disc retainer shall be of a sturdy one piece design capable of withstanding line shocks due to abnormal pump stoppage. It must have straight edge sides. No hourglass-shaped disc retainers shall be permitted and no V-type disc guides shall be used.

E. The diaphragm assembly containing a non-magnetic stainless steel stem of sufficient diameter to withstand high hydraulic pressures shall be fully guided by two bearings; in the valve cover and the power unit body. The stem shall be drilled and tapped in the cover end to receive and affix such accessories as may be deemed necessary.

F. The flexible, non-wicking, FDA approved diaphragm shall consist of nylon fabric bonded with synthetic rubber compatible with the operating fluid. The center hole for the main valve stem must be sealed by the vulcanized process or a rubber grommet sealing the center stem hole from the operating pressure. The diaphragm must withstand a Mullins Burst Test of a minimum of 600 psi per layer of nylon fabric and shall be cycle tested 100,000 times to insure longevity. The diaphragm shall be fully supported in the valve body and cover by machined surfaces which support no less than one-half of the total surface area of the diaphragm in the either the fully open or fully closed position.

G. The main valve seat, the power unit body and the stem bearing in the valve cover shall be removable. The cover bearing and seat in 6” and smaller size valves shall be threaded into the cover and body. To insure proper alignment of the valve stem, the valve body and cover shall be machined with a locating lip. No “pinned” covers to the valve body shall be permitted. All necessary repairs and/or modifications other than replacement of the main valve body shall be possible without removing the valve from the pipeline.

H. The valve manufacturer shall warranty the valve to be free of free of defects in material and workmanship for a period of three years from date of shipment provided the valve is installed and used in accordance with all applicable instructions. Electrical components shall have a one

year warranty.

I. The valve operation shall be controlled by an externally mounted, four-way solenoid-operated pilot. The solenoid shall be designed to operate on AC or DC current and have a manual operator installed. Copper tubing pilot control lines shall be provided. Opening and closing speed controls, shut off valves, strainers are to be provided.

J. Adjustable limit switch assemblies shall be mounted on the main valve connected to the main valve stem. They shall be actuated by opening or closing of the valve and easily adjusted to operate at any point of the valve's travel. The limit switches will be used to complete the pump off cycle.

K. A direct factory representative shall be made available for start-up service, inspection and necessary adjustments.

L. The deep well pump control valve shall be Cla-Val Model 61-02, or approved equal.

2.06 GLOBE VALVES

A. Globe valves shall be Class 150 or 250, resilient seat and have outside screw and yokes with rising stem and be equipped with wheel handles. Unless otherwise specified on Drawings, valves shall be furnished with flanges. Globe valves shall be manufactured by Mueller, Apollo Valve, Nibco, or approved equal.

2.07 CORPORATION STOPS

A. Corporation stops shall be ball valves and be manufactured from 85-5-5-5 brass (ASTM Designation B62), with a standard male iron pipe thread inlet and compression ("Pack Joint") outlet for copper tubing. Corporation stops shall be of the following models, or approved equal, conforming to the following table of sizes:

Service Size	**FORD Model No.**	**JAMES JONES Model No.**	**McDONALD Model No.**	**MUELLER Model No.**
3/4"	F1100	J-3403	4704-22	H-15028
1"	FB1100	J-3403	4704-22	H-15028
1-1/2"	FB1100	J-1935	4704-B22	H-15023
2"	FB1100	J-1935	4704-B22	H-15023

2.08 BALL VALVES

A. Ball valves shall be bronze and manufactured by Mueller, Nibco, Apollo Valve, Watts or equal.

2.09 AIR RELEASE AND VACUUM VALVES

A. The location, inlet size, and valve type are shown on the Drawings. Pipe and fittings used to connect valves shall be as indicated on drawings.

B. Valves shall be manufactured and tested in accordance with AWWA C512. Valves 3 inches and smaller shall be threaded with NPT inlets and outlets. The body inlet connections shall be hexagonal for a wrench connection. Larger valves shall have ANSI Class 125 flanged inlets. The valves shall have two additional NPT connections for the addition of gauges, testing, and draining.

C. The covers shall be bolted to the valve body and sealed with a flat gasket. Resilient seats shall be replaceable and provide drop tight shut off to the full valve pressure rating. Floats shall be unconditionally guaranteed against failure including pressure surges. Mechanical linkage shall provide sufficient mechanical advantage so that the valve will open under full operating pressure. A stainless steel screened outlet and protective hood shall be provided when valve is located outdoors to prevent debris from entering the valve.

D. Valve interiors and exteriors shall be coated with an NSF/ANSI 61 certified fusion bonded epoxy in accordance with AWWA C550 when in contact with potable water.

E. The valve body and covers shall be constructed of ASTM A126 Class B cast iron for working pressures up to 300 psig. Higher pressure rated valves shall be constructed of ASTM A536 Grade 65-45-12 ductile iron.

1. Combination Air Release Valve

Combination air release valve (CARV) shall have operating features of both the air and vacuum valve and the air release valve. They include both single and dual-body construction. Size and capacity shall be as specified in the Drawings.

The float shall be double guided with a guide shaft extending through the float to prevent any contact with the body. The float shall be protected against direct water impact by an internal baffle bolted to the cover or integrally cast in the body. A resilient bumper shall be provided to cushion the float during sudden opening conditions.

The compound lever design shall consist of two levers and an adjustable threaded resilient orifice button. The float, guide shafts, and bushings shall be constructed of Type 316 stainless steel. Non-metallic floats, linkage, or bushings are not acceptable.

Single body combination valves shall have an expanded outlet to provide full flow area around the guide mechanism. The valve shall have a double guided plug on 2 inch and larger sizes, and an adjustable threaded orifice button. The plug shall be protected against direct water impact by an internal baffle.

The orifice button and resilient seat shall be Buna-N. A low durometer orifice button and resilient seat shall be provided when valves are used at low operating pressures. The

resilient seat shall be a minimum of 0.5 inches thick on 2 inch and larger valves and secured in such a manner as to prevent distortion.

An optional Regulated Exhaust Device shall be provided when specified to reduce pressure surges due to column separation or rapid changes in velocity and pressure in the pipeline. The Regulated Exhaust Device shall be mounted on the inlet of the Combination Air Valve, allow free air flow in and out of the valve, close upon rapid air exhaust, and control the air exhaust rate to reduce pressure surges. The device shall have a flanged globe-style body with a center guided disc and seat assembly. The disc shall have threaded holes to provide adjustment of the air exhaust rate through the valve. The holes shall provide for a flow area of 5% of the nominal valve size. The material of the body shall be consistent with the Combination Air Valve. The seat and disc shall be bronze.

F. Valves shall be APCO as manufactured by Valve and Primer Corporation, Crispin as manufactured by Multiplex Manufacturing Company; Empire as manufactured by GA Industries, Inc.; Val-Matic or equal.

2.10 BRONZE APPURTENANCES

A. Unless otherwise specified, all interior bronze parts of valves except gate valve stems shall conform to the requirements of the "Specification for Composition Bronze or Ounce Metal Castings" (ASTM B62). Gate valve stems shall be of bronze containing not more than 5 percent of zinc nor more than 2 percent of aluminum, and shall have a minimum tensile strength of 60,000 psi, a yield strength of 40,000 psi, and an elongation of at least ten percent in 2 inches, as determined by a test coupon poured from the same ladle from which the valve stems to be furnished are poured.

2.11 VALVE OPERATORS

A. Valve operators shall be of the ACME screw, traveling-nut type, sealed, gasketed, and lubricated for underground service. The operators shall be designed to meet the input torque requirements of AWWA C504 with a maximum pull of 80 pounds on a handwheel and a maximum input of 150 foot-pounds on an operating nut. They shall be capable of withstanding an overload torque of 450 foot-pounds at full-open or full-closed position without damage to the valves or valve operators. They shall be designed to resist submergence in water to 10-foot head pressure.

B. All valves shall open counterclockwise. Valves to be installed in vaults shall be equipped with hand wheels at locations shown on the Drawings.

C. All buried valves shall be equipped with a 2-inch operating nut. Operating nuts shall comply with the requirements of AWWA Specification C500, where applicable.

2.12 VALVE OPERATING EXTENSION

A. A valve operating extension shall be required whenever the valve is installed such that the operating nut is more than 32 inches below finished grade. The valve operating extension shall be constructed of steel with a 2-inch square operating nut.

2.13 WATER VALVE BOXES

A. Water valve boxes shall be Christy G-5 or Brooks 1 RT, having a cast iron face and cast iron traffic lid. Covers shall be marked "WATER", and shall have a loose fit in the box. Valve box risers shall be fabricated from 8-inch diameter PVC pipe.

2.14 BACKFLOW PREVENTION DEVICES

A. General

All backflow preventers shall comply with AWWA C506. All backflow devices shall be freeze resistant and relieve pressure caused by ice formation. Backflow devices in outdoor locations shall be installed with a BPDI Guardshack two-piece protective enclosure around unit, hinged, stainless steel with forest green powder coating, or approved equal.

B. Fire Protection System

A backflow device is required for the fire protection system. Refer to SECTION 15300 – FIRE PROTECTION SYSTEM for backflow preventer requirements.

C. Double Check Valve

DCV devices for sizes up to 2 inches shall be Wilkins 350XL, Wilkins 950XLT2, Febco LF850, Watts LF007, Watts LF719 or approved equal.

DCV devices for sizes 2 ½ inches and larger shall be Wilkins 350, Wilkins 450, Febco LF850, Watts LF709 or approved equal.

D. Reduced Pressure Principle Valve (Water Manifold)

A RP device shall be required on all water manifold systems and in other locations as required by the City.

RP devices shall consist of a dual check valve assembly with reduced pressure zone between the check valves. A tight-closing shutoff valve shall be provided on each end of the device.

RP devices for sizes up to 2 inches shall be bronze bodied with threaded end connections and manufactured by Wilkins 375XL, Wilkins 975XL, Febco LF825YA, Watts LF919, or approved equal.

RP devices for sizes 2 ½ inch and larger shall be Wilkins 375, Wilkins 475, Watts 957, or approved equal with cast iron body and flat faced, flanged connection.

E. Pressure Vacuum Breaker (Irrigation System)

Shall be required on all irrigation systems and in other locations as required by the City.

PVB devices for sizes up to 2 inches shall be bronze bodied with threaded end connections and manufactured by Febco LF767FR, Wilkins 460XL or approved equal.

2.15 COMBINATION EMERGENCY SHOWER AND EYEWASH

A. Refer to SECTION 15140 - CHEMICAL TREATMENT SYSTEM for requirements.

2.16 PAINTING

A. The interior of valves, unless of noncorrosive materials, shall be coated with the standard manufacturer's coating which is equal to or exceeds asphalt varnish, except for fabricated steel components.

B. The interior fabricated steel components of valves and the exterior of all valves shall be coated in accordance with SECTION 09900 - PAINTING.

2.17 PRESSURE GAUGES

A. General purpose pressure gauges shall be 1% accurate with C-type bourdon tube. The bourdon tube, socket and connection tube of the gauge shall be 316 stainless steel. The case and bezel ring shall be constructed of type 304 stainless steel. Dials shall be 3-1/2" in diameter with a black pointer and a white gauge face with black print unless otherwise shown on Drawings. The gauge shall be filled with liquid glycerin or silicone oil. A bottom mount process connection shall include a snubber as a separate component. The process connection shall be 1/4" stainless steel. Pipe and fittings used to connect pressure gauges shall be indicated on the Drawings. The dial range shall indicate 10 pound intermediate graduations, with a total range of 0-100 psi unless otherwise specified herein or shown on the Drawings. The pressure gauge shall be Ametek gauge model 1535, Ashcroft 1009, Wika or approved equal.

1. Pressure gauge mounted near air release and air vacuum valve assembly to be Duralife® Ashcroft 351009SWL02LXGV150# psi or approved equal.

2. Pressure gauge mounted downstream of check valve to be Duralife® Ashcroft 351009SWL02LXGV150# or approved equal.

3. The pressure gauge mounted on the air bubbler line at the well head shall be 4-1/2" in diameter and have a range of 0-390 ft H2O. The pressure gauge shall be Part # PG45-WL as manufactured by Boshart Industries or approved equal.

2.18 HIGH PRESSURE SWITCH

A. Pressure switches shall be installed at the locations shown on the Plans with pressure ranges as noted. Pressure switch shall be Type 4 watertight construction, (non-mercury) adjustable setpoint range per Engineer, Ashcroft G-series, Asco SA-series, or equal.

2.19 PRESSURE TRANSMITTER

A. The pressure transmitter shall be installed at the locations shown on the Plans. Pressure transmitter shall be Ashcroft Duratran Transmitter Type 2279, Model #45-2279-ssh-04L-160#, no equal.

PART 3 - EXECUTION

3.01 GENERAL

A. Valve-operating units, stem extensions and other accessories shall be furnished and installed by the Contractor where shown, or where required in the opinion of the Engineer to provide for convenience in operation. Where buried valves are indicated, the Contractor shall furnish and install valve boxes to grade. All valves shall be new and of current manufacture.

3.02 VALVES

A. Before installation, the valves shall be thoroughly cleaned of all foreign material, and shall be inspected for proper operation, both opening and closing, and to verify that the valves seat properly. Valves shall be installed so that the stems are vertical, unless otherwise directed by the Engineer. Jointing shall conform to AWWA C600 or AWWA C603, whichever is applicable. Valves shall be installed as depicted on the Drawings. Joints shall be tested with the adjacent pipeline. If joints leak under test, valves shall be disconnected and reconnected, and the valve and/or the pipeline retested.

B. Faces of flanges shall be cleaned thoroughly before flanged joint is assembled. After cleaning, the gasket shall be inserted and the nuts tightened uniformly around the flange. If flanges leak under test, the nuts shall be loosened, the gasket reset or replaced, the nuts retightened, and the valve and/or pipeline retested.

3.03 VALVE BOXES

A. Center the valve boxes and set plumb over the wrench nuts of the valves. Set valve boxes so that they do not transmit shock or stress to the valves. Set the valve boxes and covers in accordance with the Drawings. Cut stem extensions to the proper length so that the valve box does not ride on the stem extension when set at grade.

B. Backfill for water valve boxes shall be the same as specified for the adjacent pipe. Backfill drain valve boxes with crushed rock as shown on the Drawings. Place backfill around the valve boxes and thoroughly compact to a density equal to that specified for the adjacent trench and in such a manner that will not damage or displace the valve box from proper alignment or grade. Misaligned valve boxes shall be excavated, plumbed, and backfilled at the Contractor's expense.

3.04 VALVE TESTING

A. All valves shall be operated and hydrostatically pressure tested in the field. Refer to SECTION 15950 – PERFORMANCE TESTING AND FACILITY STARTUP for testing requirements. Valves may be operated while filling the pipe for hydrostatic testing or as a separate step. Valves must open and close smoothly with full design pressure on upstream side and atmospheric pressure on downstream side. Test mainline valves for smooth operation will full design hydrostatic pressure on both sides of valve.

B. After hydrostatic test, operate all drain valves under design static hydraulic pressure to verify that they operate correctly. Valves must open and close smoothly and seat watertight. Repair all defective drain valves and retest at design static hydraulic pressure. Additional crushed rock and erosion control may be required based on actual flow patterns.

C. During filling, check all air and vacuum valves to verify that they are operating correctly. Operate all service valves (but not isolation valves) on air and vacuum valves, under design hydrostatic pressure to ensure that they open and close smoothly. Repair any defective valves.

PART 4 – MEASUREMENT AND PAYMENT

All work as specified herein, satisfactorily completed, shall be paid for on a Lump Sum basis as stated in **Bid Item Schedule** for the item listed below:

Bid Item No. 18 – VALVES AND RELATED APPURTENANCES

-END OF SECTION-

SECTION 15130 - VERTICAL TURBINE PUMP COMPONENTS

Bid Item No. 19

PART 1 - GENERAL

1.01 SCOPE

A. This section covers the work necessary to furnish and install one (1) vertical turbine lineshaft pump complete with motor, discharge head, steel lifting plate (if the pump setting exceeds the manufacturer's recommended setting depth), water lubricated open lineshaft assembly, bearings and bearing retainers, bowl assembly, column pipe, suction pipe, and water level measuring equipment. The same pump manufacturer shall furnish the pump, motor, column assembly, discharge head, lineshaft, and other pumping system components described under this Section. The vertical turbine pump and motor shall be capable of operating with a variable frequency drive equipment that may be furnished in the future.

B. Equipment and materials shall conform to current standards of the Hydraulic Institute, ANSI/AWWA E103, and NEMA MG-1 unless otherwise specified by this section. Equipment shall be installed in accordance with the manufacturer's recommendations and industry standard practices/procedures. Certification with NSF Standard 61 shall be provided by the National Sanitation Foundation for all well and pump materials installed that are in contact with potable drinking water.

C. The Contractor is responsible for providing all equipment necessary for field and well pump performance testing. See SECTION 15950 – PERFORMANCE TESTING AND FACILITY STARTUP and SECTION 15145 – DISINFECTION OF WELL, PUMP AND PIPING for additional requirements.

1.02 SUBMITTALS

A. All equipment manufacturers shall have an ISO 9001 certification. The only manufacturers acceptable shall be Flowserve, National, Peerless, Floway, or Goulds or approved equal.

B. The Contractor, as part of the submittal process (bid package), shall furnish for approval by the Engineer the following:

1. A manufacturer factory catalog pump performance curve which summarizes performance characteristics (including thrust bearing, hydraulic thrust, shaft weight and column shaft losses), total dynamic head (measured from top of bowls), flow rate capacity, minimum continuous service factor, net positive suction head characteristics, input horsepower, and bowl efficiency ratings, over the full operating capacity of the pump, from shut-off to run out at startup.

2. Dimensional and material drawings of the proposed pump indicating the manufacturer and model of the equipment being proposed.

C. Prior to ordering materials the Contractor shall furnish for approval by the Engineer the following:

1. A manufacturer catalog curve and calculations depicting rated capacity, rated head, NPSHr and MCSF characteristics, natural frequencies, horsepower rating, thrust calculations, efficiency ratings, motor and bowl speed, and torque curves. Because the pumps are equipped with variable speed drives, the Contractor shall provide a family of performance curves showing 10% speed intervals between 50% speed and 100% speed. All pump calculations shall be provided over the full operating capacity of the pump, from shut-off to run out conditions. **The Contractor is cautioned to furnish accurate catalog pump curves to ensure that the subsequent factory performance test results closely match the documented catalog pump curve.**

2. A complete bowl thrust curve depicting capacity and thrust over the full operating capacity of the pump, from shut-off to run out at startup.

3. An outline dimension drawing/equipment data sheet, which includes dimensions, lengths, and equipment data for the column assembly, top collar flange adapter, bowl assembly, discharge head, suction assembly and driver. The drawings shall contain dimensions along with the materials of construction for all components to be furnished.

4. Provide natural frequency calculations for the discharge head, assuming that the natural frequency is 20-percent above the maximum operating speed or 0.8 of the minimum operating speed.

D. Prior to pump installation, the Contractor shall furnish, for approval by the Engineer:

1. A certified factory curve depicting the actual tested pump performance curve (horsepower, head, capacity, efficiency, and thrust). The pump and motor shall be performance tested at the factory after assembly. Pumps shall be tested assembled with a minimum of two lengths of column pipe. Actual column losses for the full column length shall be extrapolated from the test data.

2. A minimum of six hydraulic test readings shall be taken between shutoff and runout. One of these points shall be at the rated capacity. The data shall be plotted on a pump curve showing head, flow, brake horsepower, efficiency, and NPSHr.

3. For acceptance purposes, the characteristics of the pump shall be such that the 100% motor nameplate rating is not exceeded (including shaft and thrust horsepower losses) between the minimum and maximum design points specified in Section 2.01.

4. For acceptance purposes, the total measured head from the factory performance test shall be within 2 percentage difference OR ±10 feet (whichever value is larger) at the same capacity and motor full load speed of the approved manufacturer's published catalog curve between the minimum and maximum design points specified in Section 2.01. **The Contractor is cautioned to furnish accurate factory performance pump curves to ensure that the subsequent field performance test results closely match the documented factory performance curve.**

5. The factory pump test performance curve and raw data shall be stamped and signed by a currently licensed professional mechanical or civil engineer.

6. Factory settings for the pump such as shaft tension length (amount of adjustment required to remove the "slack" of the lineshaft) and lateral setting.

7. Factory "megger" specifications for the motor.

E. Subsequent to pump installation and startup and testing, the Contractor shall furnish, for approval by the Engineer:

1. A vibration analysis report prepared by an independent testing company which specializes in and performs the pump vibration testing. The report shall present the results of all testing and provide a conclusion and verification statement that the well pump testing and vibration results meet the requirements set forth in Code M121 (ANSI.HI 9.6.4) "Vibration Testing for Centrifugal and Vertical Pumps." See SECTION 15950 - PERFORMANCE TESTING AND FACILITY STARTUP for additional requirements.

2. A well pump performance and efficiency analysis report shall be prepared by an independent testing company which specializes in and performs the well pump performance testing. The report shall present a summarize all of the testing results from testing and startup activities and provide a conclusion and verification statement that the well pump performance and efficiency results meet the requirements set forth in these specifications. See SECTION 15950 - PERFORMANCE TESTING AND FACILITY STARTUP for additional requirements.

3. A list of oils, grease, and other lubricants utilized in the motor, packing, and on the threads. The list should contain the name of the product, the name of the manufacturer and on which part(s) the product was utilized.

4. Measurements of all pump adjustments and/or settings (i.e. lateral, tension, etc.)

5. Complete installation, operation and maintenance manuals for all equipment supplied.

PART 2 - MATERIALS

2.01 DEEP WELL TURBINE PUMP

A. The deep well turbine pump unit shall be water lubricated with an open lineshaft, water lubricated assembly, turbine motor, discharge head, discharge column, drive shaft including headshaft, bearings with bearing retainers, pump suction pipe, and all other necessary appurtenances for providing a complete and reliable pump unit. The pump shall be of a size and type to comply with the specifications herein.

General Design Parameters:

Well casing diameter ID/OD (inches)	16.625/15.875
Static water level (feet)	29 - 79
Maximum nominal diameter of pump bowls (inches)	10
Column pipe diameter (inches)	8
Suction pipe diameter (inches)	8
Column pipe length, bottom of discharge elbow to top of bowls (feet)	150
Suction intake elevation (feet)	225t
Minimum motor efficiency (%) (at full load)	95
Nominal motor speed (RPM)	1800
Motor voltage, phase (V, Ø)	460, 1
Motor power (HP)	60 HP
Motor Enclosure Type	MG-1
Impeller type (enclosed/semi-open)	Enclosed
Minimum lineshaft diameter (inches)	1”
Discharge size (inches)	8”

Pump Design Points:

Discharge (gallons per minute)	500	625
Total dynamic head (feet) **(developed at the eye of top impeller)**	340	270
Minimum bowl efficiency (%) **(at rating point)**	81	77
Minimum overall plant efficiency (%) **(pump, motor & VFD at rating point)**	73	69

B. The total dynamic head specified **includes** the hydraulic column loss, discharge head friction loss and all other above ground head losses as determined by the Engineer **(above the eye of the uppermost impeller)**. The total dynamic head specified **excludes** all velocity, frictional and minor head losses through the suction pipe and bowl assembly which shall be accounted for by the Contractor **(below the eye of the uppermost impeller)**. The laboratory bowl efficiency at the design condition shall be to the right of the best efficiency point (BEP) on the head vs. capacity curve (head as ordinate and capacity as abscissa). The pump shall be designed to continuously operate at any point throughout the complete capacity-head range with short-term periods at shut-off, or longer periods at run-out, at startup, or during fire flows. The efficiency of the pumping unit shall be as high as possible to minimize operating costs.

C. Pump tests shall be performed at the factory and witnessed by a currently licensed professional mechanical or civil engineer prior to delivery. The Contractor shall make the facilities available for the City to witness pump tests if requested.

2.02 DEEP WELL TURBINE PUMP COMPONENTS

A. Electric Motor

1. The motor shall be a vertical, premium efficiency hollow-shaft, squirrel-cage induction type, inverter duty type motor compatible with a variable frequency drive as manufactured by U.S. motors, GE motors or an approved equal. The motor shall be wound for 460 volt, 3-phase A.C. power and be designed, manufactured, and tested in accordance with the latest issue of NEMA MG-1 and have a minimum service factor of 1.15 at 40 degrees C.

2. The motor shall be NEMA Weather Protected Type I Enclosure (NEMA MG1-1, 1.25.8.1) specifically designed to minimize the entrance of rain and dust and provided with screens to prevent entrance of debris and rodents.

3. The insulation shall be Class F or better with a Class B temperature rise, be non-hydroscopic and shall be resistant to attack by moisture and mechanical or thermal shock.

4. Motor bearings are to be oil lubricated with reservoir sight glass.

5. The motor shall be equipped with a 115-volt space heater. Heater shall be installed by the manufacturer or a manufacturer-approved facility. The heater shall be terminated in a separate junction box.

6. The motor shall be supplied with a non-reverse ratchet to prevent reverse rotation of the rotating elements.

7. The thrust bearings shall be designed to carry the total weight of the rotating parts, plus the hydraulic thrust at maximum operating head. If the design and operating conditions are such that upthrust can occur, proper provisions by the manufacturer shall be made to

accommodate the upthrust. The thrust bearing shall also have ample bearing capacity to permit the pump to operate during temporary operating conditions with the discharge valve in the closed position. The thrust bearing design shall obtain a minimum of 10,000 starts over the life of the motor at specified pump setting depth and static water level. At the design capacity of the pump, the motor bearing shall be sized to have a minimum B10 life of one year (or 8,760 hours) or an average life of 5 years (43,800 hours).

8. The BD of the motor shall be the same as provided for on the discharge head. No overhang or adapter is permissible.

9. The bottom of the motor shall be equipped with a steady bushing.

10. The motor shall be equipped with a non-integral steady bushing which is able to be removed or installed in the field as needed during vibration testing. See SECTION 15950 - PERFORMANCE TESTING AND FACILITY STARTUP for additional requirements.

11. The complete motor unit shall be painted after assembly with epoxy or enamel as required. Any scratches or gouges in the coating shall be field patched and coated.

B. Discharge Head Assembly

1. The discharge head assembly shall be of heavy construction, fabricated steel and shall be lined with an NSF 61 certified epoxy.

2. The head shall be equipped with AWWA Class E flat faced flanged outlets.

3. The head shall be designed to support the entire pump column/bowl setting depth when filled with water and the shut-off pressure condition times a 1.5 safety factor. The head shall be welded only by certified welders conforming to ASME code section IX. The head shall be provided with lifting "ears". A threaded drain tap shall also be provided. The discharge head and base plate shall be sealed with a 1/8-inch neoprene gasket followed with silicon sealant.

4. A 3/4-inch tap shall be provided for a pre-lubrication line, two ½" threaded taps shall be provided for the two ¼" sounding tube lines and one 1" inch threaded tap with a plug shall be furnished on the head to permit access to the well for sounding.

5. A minimum of 4 holes shall be provided for anchoring the discharge head to the pump pedestal. Anchor bolts shall be furnished for securely anchoring the discharge head in place. Anchor bolts shall be per pump manufacturer's recommendations and shall be cast in place to suit the discharge head furnished. As an option and with the Engineer's approval, the Contractor may anchor the well pump by drilling and tapping the sole plate.

6. Anchor bolts shall be furnished for securely anchoring the discharge head in place. Anchor bolts shall be per pump manufacturer's recommendations and shall be cast in place to suit the

discharge head furnished.

7. The head shall be of sufficient size to permit the use of a two-piece headshaft, coupled above the stuffing box. The water slinger shall be provided and installed below the coupling.

8. Safety screens shall be provided at the discharge head openings.

9. A natural frequency calculation shall be provided for the head, assuming that the natural frequency shall be 20 percent above the maximum operating speed or 0.8 percent of the minimum operating speed. The calculations shall be submitted with the factory drawings prior to construction of the pump.

10. The head shall utilize a baseplate of a minimum thickness of 1-inch and shall be strong enough not to flex with the application of leveling shims.

11. The top of the head at the mating point with the motor shall not be more than 0.002 inches T.I.R. (Total Indicator Reading), out of tolerance.

C. Base Plate

1. The base plate shall have a minimum thickness of 1-inch and shall be strong enough not to flex with the application of leveling shims.

2. The inside diameter of the base plate shall be equal to the outside diameter of the well casing.

3. The base plate shall be machined and tapped with a minimum of 8 holes total. 4 holes shall be provided for anchoring the base plate to the pump pedestal and a minimum of 4 holes shall be provided for anchoring the pump discharge head through the base plate to the pump pedestal.

4. Anchor bolts shall be furnished for securely anchoring the discharge head in place. Anchor bolts shall be per pump manufacturer's recommendations and shall be cast in place to suit the discharge head furnished.

D. Column Pipe

1. The column pipe shall be ASTM A53 grade B steel pipe with the ends machined with 8 threads per inch. The ends of each section of column pipe shall be faced parallel, and the threads machined to sufficient length so that the column ends will butt against the spider bearing retainer shoulder to ensure proper alignment and to secure the bearing retainers when assembled. Pipe shall be connected with threaded sleeve type steel couplings. The column pipe shall be furnished in sections not over 10-feet in length.

2. Minimum column pipe wall thickness for each nominal pipe diameter shall be Schedule 30

as follows:

Nominal Size	Outside Diameter	Minimum Wall Thickness	Weight per Length
4”	4.500”	0.237”	10.79 lb/ft
5”	5.563”	0.258”	14.62 lb/ft
6”	6.625”	0.280”	18.97 lb/ft
8”	8.625”	0.277”	24.70 lb/ft
10”	10.750”	0.307”	34.24 lb/ft
12”	12.750”	0.330”	43.77 lb/ft
14”	14.000”	0.375”	54.57 lb/ft
16”	16.000”	0.375”	62.58 lb/ft

3. Column size shall conform to the standard bowl discharge size and to the permissible column sizes for the selected discharge head. Column pipe wall thickness shall be designed to bear the entire load of the column pipe and bowl assembly

E. Lineshaft

1. Lineshaft shall conform to the requirements of AWWA E103-07. The maximum combined sheer stress shall not exceed 30% of the elastic limit in tension or be more than 18% of the ultimate tensile strength of the shafting steel used. The lineshaft shall be of ample size to operate the pump without distortion or vibration while transmitting the maximum horsepower imposed by the bowl assembly.

2. The maximum combined sheer stress for the lineshaft couplings shall not exceed 20% of the elastic limit in tension, nor be more than 12% of the ultimate tensile strength of the shafting steel used.

3. The lineshaft (including headshaft) shall be ASTM A582, type 416 stainless steel connected to type 316 stainless steel lineshaft couplings and shall have a surface finish at bearing locations not to exceed 40 Ra per ANSI B46.1. The lineshaft shall be furnished in interchangeable sections not over 10 feet in length. The butting faces shall be machined, faced, and recessed square to the axis of the shaft. To insure accurate alignment, the shaft shall be straightened to within 0.005-inches total indicator reading per 10 feet in length. The maximum permissible error in the axial alignment of the thread axis with the axis of the shaft shall be 0.002 inches per 6 inches in length. The sections shall be turned, ground, and polished. Lineshaft couplings shall have left handed thread to tighten during pump operation. The lineshaft shall be of ample size to operate the pump without distortion or vibration while transmitting the maximum horsepower imposed by the bowl assembly. Lineshaft shall be sized such that elongation due to hydraulic thrust will not exceed the clearance available of the impellers in the pump bowls.

4. The pump manufacturer shall include a method of adjusting the pump impellers at the top of the headshaft. The adjustment method shall provide a positive locking device.

F. Bronze Centering Spiders (Bearing Retainers)

1. The shaft bearings shall be designed to be lubricated by the water pumped. Shaft bearings shall be mounted in bronze centering spiders (bearing retainers) that shall be held in position in the column couplings by means of the butted ends of the column pipes. Bearings shall be new fluted neoprene rubber retained in the spider by a shoulder on each end of the bearing.

2. The bearings shall be spaced at intervals of not more than 10 feet. A spider bearing shall be installed no lower than five feet below the discharge head to ensure adequate support of the lineshaft through the head for alignment purposes.

G. Pump Bowl Assembly

1. Internal and external ferrous surfaces in contact with water shall be coated with an NSF/ANSI 61 certified vitreous glass enamel or fusion bonded epoxy.

2. The pump bowl assembly shall include bowls made of close-grained cast iron, free from blow holes, sand holes or other detrimental defects, ASTM A48 Class 30. The bowl design shall be heavy walled to withstand the pressure developed by the pump. The intermediate bowls shall be constructed with alternating bronze-backed marine bearing and neoprene bearing to support the impeller shaft. The bowl unit shall be capable of withstanding a hydrostatic pressure equal to twice the pressure at the rated capacity or 1.5 times the shutoff head, whichever is greater.

3. The impeller shaft shall be made of 416 stainless steel, turned, grained and polished. It shall be supported by bronze bearings above and below each impeller. Each impeller shall be made of bronze, cast in one piece, enclosed, accurately machined, underfiled, slurry polished to 60 microns RMS (ISO 19-40 Grade 6.3) and be statically and dynamically balanced. Each impeller shall be securely fastened to the shaft with a tapered lock collet/bushing of the same material as the bowl shaft. The bowl shall include an inserted side seal at the impeller skirt. The top discharge case shall be fitted for water lubricated duty. All bolting shall be 316 stainless steel.

H. Suction Assembly

1. The suction pipe and couplings shall be made from unplasticized PVC compounds having a minimum cell classification of 12454, as defined in ASTM D1784. The compound shall qualify for a Hydrostatic Design Basis (HDB) of 4000 psi for water at 73.4° F, in accordance with the requirements of ASTM D2837. White pipe shall be supplied, unless otherwise approved by the Engineer. The suction pipe shall be intended for contact with potable water

and shall be evaluated, tested, and certified for conformance with NSF 61. Pipe sections shall be 20' long.

2. All pipe supplied to this specification shall meet the performance requirements of ASTM D1785 for SCH 80 pipe.

3. Pipe shall be joined using a spline lock joint. High-strength, acid-resistant, flexible thermoplastic splines shall be inserted into mating precision-machined grooves to provide continuous restraint with evenly distributed loading. No external pipe-to-pipe restraining devices which clamp onto or otherwise damage the pipe surface as a result of point-loading shall be permitted. The joining system shall incorporate elastomeric sealing gaskets which are designed to provide a watertight seal. Drop pipe shall be joined to the pump using a Stainless Steel Drop Pipe Adapter provided by the same manufacturer as provides the drop pipe, and which utilizes the same spline lock joint as used on the drop pipe.

4. Drop pipe shall be legibly and permanently marked in ink with the following information: Manufacturer and Trade Name, Nominal Size & SCH Rating, Manufacturing Date Code and NSF 61 certification.

5. PVC suction pipe shall be Certa-Lok as manufactured by North American Pipe Corporation, or approved equal.

2.03 NAMEPLATES

A. Each major item of equipment shall have the manufacturer's name, address, type or style, model, serial number, and catalog number on a stainless steel plate secured to the item of equipment. In the case of the submerged pump assembly and vertical turbine motor, a pump/bowl nameplate shall be placed in a visible location on the pump discharge head and a vertical turbine motor nameplate shall be placed in a visible location on the vertical turbine motor.

B. The nameplate for the pump located on the discharge head shall show the manufacturer, size, capacity in gallons per minute, rated total dynamic head in feet, speed in revolutions per minute, model type, # of stages, impeller diameter, year, serial number, and other pertinent data.

C. The nameplate for the vertical turbine motor located on the discharge head shall show the manufacturer, model type, rated horsepower, rated full load amps, service factor, voltage, nominal efficiency, frequency, phases, time rating, maximum ambient temperature, insulation class code letter, revolutions per minute, year, serial number, and other pertinent data.

2.04 WATER LEVEL MEASURING EQUIPMENT

A. Air Bubbler System

Two 1/4-inch O.D. x 0.065" wall thickness, 316 stainless steel tubing airlines shall be furnished and strapped on the column pipe. The airline tubing shall be strapped on opposite sides of the

column pipe at 40-foot intervals starting at the pump setting depth (top of pump bowls) and terminating 5 feet from the discharge head. The stainless steel tubing shall be installed from one continuous roll with no joints. The tubing shall be furnished with sufficient length to reach the termination box at the well head to the top of the well pump bowl assembly. SS bushings or compression fittings shall be used to seal the annular space between each airline tubes and two ½" discharge head ports. The airline assembly shall be connected to a water level readout assembly as shown on the Drawings. The extra airline assembly shall be capped and sealed inside of the air bubbler termination box. The air bubbler termination box shall be waterproof and house a direct reading (in feet) depth gauge of 4-½" diameter, Schrader valve and all other necessary fittings. Refer to SECTION 15110 – VALVES AND RELATED APPURTENANCES for pressure gauge requirements.

The airline from the wellhead termination box to the existing well pump building shall be a 3/8 inch O.D. 160 psi working pressure rated, clear high-density polyethylene tubing. Tubing shall be furnished with a total length of tubing sufficient to reach the wellhead from the air compressor in the existing building five additional feet. The HDPE tubing shall be installed from one continuous roll with no joints.

B. Air Compressor

The air bubbler line shall be charged by a new air compressor mounted in the MCC. The air compressor shall be a GAST, 1/6 HP, Model #1HAB-84T-M100X, no equal.

C. Sounding Tube

The Contractor shall furnish and install HDPE tubing to be used as a sounding pipe. Before installing tubing, the Contractor shall verify that there is enough diametrical clearance between the discharge head barrel and the well casing. The tubing shall be strapped to the column pipe at 40-foot intervals starting at the pump setting depth (top of pump bowls) and terminating 5 feet from the discharge head. The Contractor shall ensure the tubing is not strapped so tightly as to cause deformation to the tubing. The Contractor shall ensure the completed installation of the well pump and HDPE sounding tube allows for clear passage of a well sounder probe from the surface to the pump setting depth. The tubing shall be connected and strapped to a threaded 1 inch, 316 Stainless Steel King Combination Hose Nipple. The King Nipple shall connect to the discharge head and the tubing shall be covered with threaded PVC plug. The HDPE tubing shall be ¾" inch nominal diameter, SIDR 7. HDPE tubing shall be manufactured Centennial Plastics Inc. (CenFlo), or approved equal. The column straps shall be stainless steel, 0.75 inch wide and 0.30 thick, and shall be manufactured by Band (Model Band-It C206 Easy Scale Band), or approved equal.

PART 3 - EXECUTION

3.01 GENERAL

A. The manufacturer's authorized service representative shall visit the site for as long as necessary to complete the following and to certify in writing that the equipment and controls have been

properly installed, aligned, lubricated, adjusted, and readied for operation. The manufacturer's authorized service representative shall:

1. Witness the proper installation of the equipment.

2. Witness the inspection, checking, and adjusting the equipment.

3. Witness startup and field-testing operations, and efficiency testing.

4. Instruct the City's personnel in the operation and maintenance of the equipment, including step-by-step troubleshooting with necessary test equipment. Instruction and materials shall be specific to the models of equipment provided. The representative shall have at least two year's experience or training with equipment provided.

3.02 INSTALLATION

A. The vertical pump and motor components shall be installed in accordance with the pump manufacturer's recommendations for proper handling and installation of vertical turbine well pumps. The well pump shall be installed by a Contractor who is engaged in the full-time business of selling, installing, and repairing vertical turbine lineshaft pumps. The pump subcontractor shall also be a factory dealer for the proposed equipment. The Contractor shall possess a valid C-57 or C-61 (D-21) license in effect and in good standing with the California Contractors State License Board. The well pump shall be installed to the approved shop drawings and in accordance with the Contract Documents. The installation rig and equipment shall be an industry rig, set up and configured for the sole purpose of installing and removing well pumps. All rigging and equipment shall be properly sized to safely accommodate the load. All installation personnel shall wear all appropriate safety equipment, including hard hats.

B. The column pipe, suction pipe, and pump bowls are to be hot water high pressure cleaned prior to transporting the entire pump to the site. If in the opinion of the Engineer the pump has not been adequately cleaned, the pump components shall be hot water high pressure cleaned again to the satisfaction of the Engineer.

C. The Contractor shall verify lineshaft straightness by rotating the lineshaft sections on V blocks and measuring the lineshaft run out at two points by means of a dial indication. Lineshaft sections with a run-out in excess of 0.002 inches shall be straightened.

D. The pump equipment, including motor, shall be stored on clean timbers at all times. Suitable precautions shall be taken to restrict sand, silt, or other foreign matter from entering the pump or motor.

E. Prior to installation of the pump, the well shall be bailed to remove any oil or fill material that may be present to the satisfaction of the Engineer. The Contractor shall measure the static water level and total well depth. Report any deviation to the Engineer prior to installation.

F. The factory assembled pump assembly shall be lifted into the vertical position before uncrating. If the pump is disassembled for installation, a factory representative acceptable to the Engineer shall be present to ensure proper re-assembly. The Contractor shall take precautions to install the pump assembly without causing damage.

G. Measure and record the available lateral in the bowl assembly.

H. Ensure and demonstrate, if so requested by the Engineer, that shaft alignment is within manufacturer's tolerances by lowering the lateral and removing the drive clutch for inspection of the headshaft adjustment within the motor hollow-shaft. If the shaft is not centered (within 0.005 inch), the Contractor shall realign the pump at no cost to the City and reimburse the City for follow up inspection(s).

I. The Contractor shall verify shaft straightness by rotating the shaft sections on V blocks and measuring the shaft run out at two points by means of a dial indication. Shafts with a run-out in excess of 0.002 inch shall be straightened.

J. The Contractor shall utilize the proper or manufacturer recommended thread compounds for column and lineshaft threads. Pipe lubricants and compounds shall be certified to NSF 60/61 where contact with potable water is expected.

K. Install the pump in accordance with the manufacturer's directions. The Contractor shall maintain a copy of the manufacturer's installation manual on location during installation, startup, and testing.

L. Once the pump, discharge head, and motor have been installed, the motor and shaft shall be aligned by the Contractor so that the top shaft stands exactly and freely in the center of the motor hollow shaft. Correction of misalignment shall be performed by driving tapered metal shims between the concrete pedestal and the sole plate until the shaft centers exactly in the motor. Ensure, and demonstrate if so requested by the Engineer, that shaft alignment is within manufacturer's tolerances. After aligning the motor and headshaft, the void area under the sole plate shall be filled with hydrophilic grout, in accordance with manufacturer's directions. Recheck the motor and shaft alignment adjusting shims as necessary if alignment has been disturbed. After the grout has hardened, a silicone seal shall be placed around the head.

M. The pump lateral shall be re-checked, prior to and after the rotation has been checked and the pump ran for at least ten minutes.

N. The well shall be disinfected in accordance to AWWA C654. See SECTION 15145–DISINFECTION OF WELL, PUMP AND PIPING for disinfection requirements before, during, and after well pump installation and startup.

O. The Contractor shall perform all required pump performance and vibration testing in accordance with SECTION 15950 - PERFORMANCE TESTING AND FACILITY STARTUP. Any malfunctioning equipment, excessive vibration, or other problems shall be corrected by the Contractor at his/her expense.

P. The pump assembly and column pipe shall be inspected for the presence of surface scratches to the epoxy coating system before lowering the equipment into the well. Any scratches or gouges in the pump equipment coatings and all exposed column threads shall be field-patched with NSF 61 approved epoxy formulated to fully cure immersed in water.

Q. The Contractor shall utilize the proper or manufacturer recommended thread compounds for column and lineshaft threads. Pipe lubricants and compounds shall be certified to NSF 60/61 where contact with potable water is expected.

R. Install the pump in accordance with the manufacturer's directions. The Contractor shall maintain a copy of the manufacturer's installation manual on location during installation, start-up, and testing.

3.03 PUMP ALIGNMENT

A. Once the pump, discharge head, and motor have been installed, the motor and shaft shall be aligned by the Contractor. The discharge piping shall be disconnected from the discharge head, the discharge head bolts and base plate bolts must be loosened and the motor steady bushing shall be removed from the motor prior to alignment procedure.

B. Ensure the stub shaft and head shaft are within factory straightness tolerances of 0.002 inches. Straighten shafts as needed. Without straight shafts the balance of the work shall not proceed.

C. With the stub shaft installed, the head shaft removed and the stuffing box not in place, carefully measure the clearance around the stub shaft to the side of the machined discharge head stuffing box bore and drive tapered metal shims between the concrete pedestal and the base plate on the side opposite the largest measured clearance to the shaft. Record clearance and drive additional shims until the clearance measured around the shaft is uniform. Ensure, and demonstrate if so requested by the Engineer, that shaft alignment is within manufacturer's tolerances.

D. After alignment is completed, the void area under the base plate shall be filled with hydrophilic non-shrink grout, in accordance with manufacturer's directions. Recheck the alignment adjusting shims as necessary if alignment has been disturbed. After the grout has hardened, the leveling shims shall be removed or backed off and the base plate shall be fastened tightly to the anchor bolts, solidly against the grout bed. Damaging vibration may result if the base plate is not solidly in contact with the grout bed.

E. Install and adjust the stuffing box per the manufacturer's instructions. Install the steady bushing under the motor. Install the head shaft and motor drive coupling. Do not install the key in the

coupling until the motor rotation is correct. Check rotation, and correct if necessary.

F. Thread the lateral adjusting nut and screw it down the shaft until just seated on top of the drive coupling. Measure and record the shaft stickup above the adjusting nut. Take up the lateral until the impeller comes in contact with the top of the bowl housing. Measure and record the shaft stickup above the adjusting nut. This is the total lateral takeup. Lower the shaft to effect the impeller lateral setting recommended by the pump manufacturer. Record the shaft length above the coupling.

G. Measure the static voltage, start the pump and after recording the running voltage and amperage, stop the pump and reset the lateral (to ensure the lateral settings are the same after lineshaft coupling makeup).

H. Ensure and demonstrate, if so requested by the Engineer, that shaft alignment is within manufacturer's tolerances by lowering the lateral and removing the drive clutch for inspection of the headshaft adjustment within the motor hollow-shaft. If the shaft is not centered (within 0.005 inch), the Contractor shall realign the pump at no cost to the City and reimburse the City for follow up inspection(s).

3.04 TESTING

A. The Contractor shall perform all required pump performance and vibration testing in accordance with SECTION 15950 - PERFORMANCE TESTING AND FACILITY STARTUP. Any malfunctioning equipment, excessive vibration, or other problems shall be corrected by the Contractor at his/her expense. The fully completed installation shall be placed in typical operation for a period no less than 4 hours, one day prior to acceptance testing by the Engineer.

3.05 DISINFECTION

A. The well and well pump shall be disinfected in accordance to AWWA C654. See SECTION 15145 – DISINFECTION OF WELL, PUMP AND PIPING for disinfection requirements before, during, and after well pump installation and startup.

3.06 WARRANTY

A. The Contractor shall provide a full warranty on all pump materials and installation for a period of one (1) year from date of startup. In the case of non-compliance with the stated specifications, the City may require Contractor to repair the pump unit, including parts and labor to make repairs, up to and including removal and replacement of all or part of the pump unit.

3.07 TRAINING

A. See SECTION 01735 – TRAINING REQUIREMENTS for training requirements.

PART 4 – MEASUREMENT AND PAYMENT

All work as specified herein, satisfactorily completed, shall be paid for on a Lump Sum basis as stated in **Bid Item Schedule** for the item listed below:

Bid Item No. 19 – VERTICAL TURBINE PUMP COMPONENTS

VFD Pump Field Test Data

Date Tested:_____

Performed by:_____(Contractor)

Witnessed by:_____(Engineer)

Static Water Level:_____

Wait 20 minutes after starting the pump before taking Test 1 readings.

All field test measurements shall be read from the panel <u>and</u> compared to head measurements.

	Drive Readings (Read from Panel)						
Test	**Voltage (Volts)**	**Current (Amps)**	**Frequency (Hz)**	**Power (HP)**	**Flow (gpm)**	**Discharge Pressure+ (psi)**	**PWL (feet)**
1							
2							
3							
4							

	Readings Taken By Hand						
Test	**Voltage* (Volts)**	**Current* (Amps)**	**Frequency* (Hz)**	**Power* (HP)**	**Flow** (gpm)**	**Discharge Pressure+ (psi)**	**PWL*** (feet)**
1							
2							
3							
4							

* Readings taken at the pump by hand
** Readings from the flowmeter
*** Readings taken with the use of a water level sounder apparatus
+ Pressure readings taken from pressure gauge located as close as possible to well pump discharge head

SECTION 15140 – CHEMICAL TREATMENT SYSTEM

Bid Item No. 20

PART 1 - GENERAL

1.01 SCOPE

A. This section covers the work necessary to furnish, install and test a complete sodium hypochlorite chemical feed system including all pumps, pump skid, injectors, tanks, drums, scales, hand trucks, piping, fittings, closure pieces and all related appurtenances, as shown on the Drawings and as specified herein.

1.02 RELATED WORK

A. Instrumentation and electrical work not specified herein are included in Divisions 15 and 16 but shall still be provided by the Contractor where so indicated. The instruments are shown in the Drawings.

1.03 SUBMITTALS

A. Submit complete specifications, catalog information and cutsheets, MSDS, descriptive drawings, wiring and control diagrams, control panel layout, and literature for the equipment to be furnished under this Section. Include documentation that all materials used in the system supplied are compatible with the chemical being utilized.

B. Submit layout drawings of the complete sodium hypochlorite feed and control system. The layout drawings shall be on 11-inch by 17-inch paper.

C. Submit the delivery methods of the sodium hypochlorite chemical prior to the scheduling of chemical deliveries.

D. Submit chemical samples within ten (10) days of first delivery. Samples may not be returned. All samples shall be accompanied with the percent active chemical content from a state certified analytical laboratory:

E. Certification with NSF Standard 61 shall be provided by the National Sanitation Foundation for all chemical treatment system materials used in the production, treatment or distribution of drinking water in contact with drinking water including contact with raw water to be treated.

F. Certification with NSF Standard 60 shall be provided by the National Sanitation Foundation for all chemicals or products added to the drinking water including raw water to be treated.

G. The Contractor shall provide with his/her submittals, a manufacturers' suggested list of spare parts for all sodium hypochlorite equipment furnished under this Section. Such list shall include all spare parts which the manufacturer(s) expect to be required for maintenance/replacement purposes during the first two years of equipment operation. The list shall include part numbers, part description and current pricing. Prices are to be valid for a period of one year following the date of system commissioning.

H. Submit manufacturer's recommendations for painting and coating of equipment.

I. The Contractor shall submit details of proposed nameplates, a sample of each symbol, lettering style and size.

J. Provide manufacturer's certification of satisfactory factory test performance.

K. Submit manufacturer's installation instructions and recommendations.

L. Submit six (6) copies of complete equipment field testing and calibration procedures for review and approval by the Engineer.

M. Submit O & M Manual data and contents per the requirements of SECTION 01730 – OPERATIONS AND MAINTENANCE.

N. In the event that it is impossible to conform to certain details of this Section, describe completely all non-conforming aspects.

1.04 QUALITY ASSURANCE

A. Like items of equipment specified herein shall be the end product of one manufacturer in order to achieve standardization of appearance, system compatibility, operation, maintenance, spare parts and manufacturer's services.

B. All of the equipment furnished under this Section shall be the product of manufacturers who are fully experienced, reputable and qualified in the manufacture of the system components to be furnished. Manufacturers of equipment furnished under this Section shall have a minimum of five (5) years verifiable experience in the manufacture of such equipment.

C. The following equipment specified herein is intended to give a general description of what is required, but does not cover all details which may vary in accordance with the exact requirements of the equipment as offered. It is, however, intended to cover the furnishing, delivery, installation, field testing and field calibration of all materials and apparatus as required. Any additional equipment necessary for the proper operation of the proposed installation not specifically mentioned in this Section and/or shown on the Drawings shall be furnished and installed.

D. Unless specifically noted otherwise, the arrangement of equipment shown on the Drawings is based upon information available at the time of design and is not intended to show exact dimensions associated with a specific manufacturer. The Drawings show the general diagram and the nominal location of the equipment and shall be adjusted to meet actual equipment installation requirements. The Contractor shall be responsible for specific installation details for piping, valves, and electrical and instrumentation connections to accommodate the equipment provided.

PART 2 - MATERIALS

2.01 SODIUM HYPOCHLORITE (CHLORINATION) PUMP

A. The sodium hypochlorite pumps shall be diaphragm-type, solenoid-driven and microprocessor-controlled.

B. The pump housing shall be constructed of fiberglass-reinforced PPE plastic, with a NEMA 4X enclosure rating to protect against corrosion, dust and water. A removable hood shall be provided which covers the faceplate.

C. The sodium hypochlorite pump(s) shall be powered with 115VAC, 50/60Hz, single phase power supply. The microprocessor is to automatically compensate for supply voltage variations within 15% of the rated voltage such that frequency if the pump remains constant.

D. The sodium hypochlorite pump(s) shall be capable of **0.75 gallons per hour against a system pressure of 100 pounds per square inch.**

E. All pumping functions shall be set by membrane-switch keypad and status shall be displayed on an illuminated LCD on the pump, which is readable at an offset angle of 45 degrees. Keypad will allow for simple scrolling and display of programmed parameters. Output shall be hot rated at operating temperature, and adjustable while pumps are in operation. Capacity adjustment shall be via dial knobs for stroke length and stroke frequency. Stroke length adjustment shall have a locking lever. Control functions shall be manual with external pulse input and stop or with external 4-20 mA input stop. The Contractor shall furnish and install all necessary transmitters, etc. to provide a completely functional unit.

F. Positive flow shall be ensured by a minimum of four ball type check valves. The pump shall be furnished with a five-function valve to provide for pressure relief, backpressure, anti-syphon, air bleed and discharge drain. A vibration dampener, suction with strainer, discharge piping with injector/diffuser system shall also be provided.

G. The liquid end of the pump shall be physically separated from the drive unit by a back plate with a weep hole creating an air gap. An elastomer shaft wiper seal shall prevent contamination of the solenoid if the primary diaphragm fails.

H. The diaphragm shall be constructed of a fabric-reinforced EPDM elastomer with a plastic core and with a PTFE-faced fluid contact surface. The liquid end shall be Acrylic with Viton seals, PVC suction/discharge valves and ceramic valve balls. The liquid end shall be equipped with a built-in coarse valve and needle valve for air bleed, manually adjusted for continuous degassing of process fluid and self-priming against pressure. The suction and discharge valves shall be of the double ball check design.

I. The Contractor shall furnish one spare pump, tubing and a factory "preventative maintenance" kit which shall include, at a minimum, a new diaphragm, check valves, o-rings, etc

J. The pumps shall be a Premia 75 Series, as manufactured by Wallace & Tiernan or approved equal.

2.02 CHEMICAL FEED PUMP ACCESSORIES

A. A single chemical metering pump manufacturer shall be responsible for supplying and assembling all components of the chemical feed system, in addition to testing the metering system prior to shipment. The chemical feed pumps shall include the following accessories;

B. A foot valve and strainer, constructed of materials compatible with the chemicals to be used, shall be provided with each pump.

C. An injection check valve, constructed of materials compatible with the chemicals to be used, shall be provided with each pump.

D. A universal control cable with 5-pole round plastic connector and 5-wire cable with loose ends shall be provided with each pump.

E. A two-stage float switch, constructed of materials compatible with the chemicals to be used, shall be provided with each pump to monitor tank level.

F. An adjustable discharge flow monitoring device, constructed of materials compatible with the chemicals to be used, shall be provided with each pump. The flow monitor shall be capable of signaling a fault condition to the pump.

G. A diaphragm failure detector shall be provided to (open/close) a contact for alarm in the event of a diaphragm failure.

H. An adjustable-pressure, diaphragm-type backpressure/anti-siphon valve, constructed of materials compatible with the chemicals to be used, shall be provided with each pump.

I. An in-line, adjustable-pressure, diaphragm-type pressure relief valve, constructed of materials compatible with the chemicals to be used, shall be provided with each pump.

J. An air-charged, bladder-type pulsation dampener, constructed of materials compatible with the chemicals to be used, shall be provided with each pump. The pulsation dampener shall be sized to reduce pulsations by at least 90% at full pump capacity.

K. A clear calibration column with FNPT fitting on top and bottom, constructed of materials compatible with the chemicals to be used, shall be provided with each pump. The column shall be sized to provide at least 2 minutes draw down at maximum pump capacity.

L. Sufficient tubing, constructed of materials compatible with the chemicals to be used, shall be provided with each pump.

2.03 SODIUM HYPOCHLORITE INJECTOR

A. The chlorine injector nozzle shall be made from CPVC, suitable for chlorine and caustic, with a ½" NPT nozzle tube inlet, and rated to 150 psi. Nozzle shall be fitted with safety wire to keep from blowing away during removal.

B. Nozzle assembly shall be a Model LE-490HI as manufactured by LMI, no equal.

2.04 CHEMICAL FEED ROOM VENTILATION SYSTEM

A. Refer to SECTION 15700 – VENTILATION for ventilation requirements.

2.05 COMBINATION EMERGENCY SHOWER AND EYEWASH STATION

B. Refer to SECTION 10440 – SIGNS AND SAFETY EQUIPMENT for emergency eyewash/shower station requirements.

2.06 SODIUM HYPOCHLORITE

A. The Contractor shall provide two (2) 55-gallon drums of sodium hypochlorite.

B. Except as otherwise specified herein, all sodium hypochlorite must conform to Sections 1 and 2 of AWWA B300. In the event of a conflict in the two specifications, the more restrictive provision will apply.

C. Sodium hypochlorite shall meet Title 22, California Code of Regulation, Division and Environmental Health, Chapter 18, Drinking Water Additives, ANSI/NSF 60 Standards.

D. Sodium hypochlorite solution shall contain a 12.5% solution straight as sodium hypochlorite by weight. The sodium hypochlorite delivered to the project site shall meet the following minimum specifications:

1. pH greater than 12

2. Ni+ concentrations less than 0.1 mg/l
3. Specific gravity greater than 1.14
4. ClO_3 concentration less than 1.5 g/l
5. Delivery within 4 days of manufacture
6. Storage temperature prior to delivery below 20°C (68°F)

E. The sodium hypochlorite solution shall be a clear liquid, free from foreign matter and shall contain no more than 50 ppm of suspended matter.

F. Free alkali as NaOH by weight percent shall be between 0.3% and 0.6%.

G. No sodium hypochlorite used in the manufacturing process shall be produced by the mercury cell method.

2.07 CHEMICAL DAY TANK

A. Contractor shall furnish one 50-gallon chemical polyethylene day tank, as manufactured by PolyProcessing, filled with 12.5% Sodium Hypochlorite solution.

2.08 CHEMICAL TANK LEVEL DEVICE

B. The Contractor shall furnish one Gizmo Engineering Model #TH-PVC-10 battery powered process timer to monitor/alarm sodium hypochlorite tank levels.

2.09 CHEMICAL DRUM BARREL PUMP

A. The Contractor shall provide a chemical transfer pump. Pump shall be a Finish Thompson Inc. (FTI) model# M3T, Part# A101128, Output 0.5 HP 115VAC Motor with a TCI pump model# TBP40 Part#DTBP002.

2.10 DRUM SCALE

A. Drum scale shall be of the hydraulic load cell type. Scale shall be sized to accept drums or carboys from 18"- 24" in diameter. Platform height shall be no more than 2" to allow for easy handling and unloading of drums. Platform scale coating system shall be a minimum dry thickness of 80 mils and be resistant to moisture, chemicals, abrasion, impact and UV light. Load cell shall be of the temperature stable, rolling diaphragm type. A flexible length of tubing shall lead from the load cells to allow easy installation of the dial on the platform mounted dial stand.

B. Dial diameter shall be 8-1/2" with provision for tare adjustment. Scales shall carry a minimum Five (5) Year Factory Warranty. Scale shall have a SATELLITE® loop powered 4-20mA output proportional to gross weight. Full-scale accuracy shall be better than ½ of 1%. Scale shall Model 8D10DS, with 27.5 square plat form, 8.5-inch dial, and 4-20mA output proportional to gross weight scale as manufactured by FORCE FLOW, 2430 Stanwell Drive, Concord, CA 94520

USA (www.forceflow.com), or equal.

2.11 HAND TRUCK

A. The Contractor shall furnish one hand truck for the purpose of moving a rounded 55 gallon chemical drum. The hand truck shall be made from 1-inch structural steel pipe frame and have a 1000-pound capacity. All joints shall be double welded. Hand truck shall be Wesco Industrial Products Model No. 20BT or approved equal.

2.12 NAMEPLATES

A. The Contractor shall furnish and install 16-gauge type 316 stainless steel identification plates for all equipment required to be identified. The plates shall be securely mounted on the equipment in readily visible locations. The plates shall bear, in 1/4-inch die-stamped lettering, the equipment identification numbers. Nameplates shall be provided for all equipment furnished under this section. The Contractor shall submit proposed lettering for approved by the City prior to fabrication.

B. Nameplates and adhesive shall be resistant to oils, vibration, moisture, solvents and weathering.

PART 3 - EXECUTION

3.01 GENERAL

A. All chemical treatment equipment shall be installed in accordance with the manufacturer's recommendations, installation instructions, industry standard practices/procedures and as detailed on the Drawings.

B. Drawings for are diagrammatic and not intended to specifically define element locations or pipe run lengths. Material amounts and required installation configurations shall be based on field measurements.

C. All components shall be accessible for ease of operation and maintenance.

3.02 CHEMICAL FEED PUMP PROGRAMMING AND CONTROL

A. Stroke length control shall be manually adjusted between 100% and 0% with a stroke adjusting knob on the pump control face. The LCD shall digitally display stroke length setting in 1% increments in the full range between 100% and 0%.

B. Programming shall allow pump to be calibrated so as to display pump output in gallons/hour or liters/hour. Calibration shall be maintained when stroke length is altered up to plus or minus 10% on the stroke length knob. If stroke length is altered by more than 10%, a yellow warning light will light and a flashing message "calib" will appear.

C. The pump shall be equipped with programmable function of pressure levels to allow pump to operate at reduced pressures from the maximum rated pressure of the pump.

D. The pump shall be equipped with the programmable function of electronic interlocking of the keypad by access code to prevent unauthorized adjustments to the pump.

E. Keypad shall allow for scrolling and display on LCD such parameters as stroke frequency, stroke length, stroke counter, pump output in gals/hr or l/hr, dosing quantity, mA current input being received by pump, and indication of external mode.

F. Stroke frequency control shall be manually adjusted by touch key pads, with the set stroke rate displayed on the LCD. The metering pump shall be capable of receiving a pulse input via optional external control cable such that 1 pulse gives 1 pump stroke. The metering pump shall be capable of remote ON-OFF operation using the PAUSE function via a voltage-free contact relay through an optional control cable. In addition, the pump shall be configured with analog input functionality. The pump shall accept an analog signal such that stroke frequency is proportional to 0/4-20mA or 20-4/0mA, the choice of which is programmable at the pump. The pump shall allow the setting of maximum stroke rate, which corresponds to the maximum analog signal, with stroke rate proportional to signal strength below that rate. Programming for curve processing shall also be possible, in which any stroke frequency ration in proportion to the electrical signal can be configured. Analog to digital converters external to the pump shall not be allowed.

G. A 2-stage float switch shall be supplied to the stop pump prior to losing prime and annunciate low level on the pump LCD display.

H. An SPDT relay shall be installed for both fault indication and pacing relay. The metering pump shall have an integral relay to allow remote annunciation of a fault condition (i.e. low chemical supply in tank/lack of chemical supply shut down, flow monitor, system faults, and fuse/power supply failure). Configure as NC contact closure relay. The metering pump shall also have an integral relay to issue a contact closure with every pump stroke to pace a second pump. The pacing relay shall be electrically isolated via an optical coupler with a semiconductor switch.

3.03 CHEMICAL DELIVERY

A. No chemicals shall be delivered to the site until all safety equipment has been approved and certified by the City and Santa Clara County Fire Department.

B. Bulk delivery shall be by truck tank car. The supplier must provide all unloading equipment including air padding facilities and hoses with appropriate fittings for coupling to the City's chemical unloading facilities. The unloading facilities have standard flange connections. The supplier must furnish air for chemical offloading.

C. The supplier's normal delivery must be as follows:

1. Deliveries to City facilities within forty-eight (48) hours after phone notification by the City.

2. Delivery within twenty-four (24) hours must also be available for emergency situations. The City will pay a surcharge if emergency delivery is expected. The supplier must have a twenty-four (24) hour a day order telephone service. An emergency surcharge will be determined by City prior to original purchase.

3. The Contractor will be responsible for all costs of clean-up and disposal of product spilled during delivery, if such spill is caused by inappropriate Contractor procedures or failure of Contractor owned equipment.

3.04 INSPECTION

A. The City's representatives shall be permitted to inspect all equipment during construction and at completion. The Contractor shall notify the engineer at least 48 hours in advance of completion to arrange for inspection by the City's representative at completion.

B. Evidence of poor workmanship or lack of compliance with the purchase order, drawings or specifications will be grounds for rejection of the equipment. The interior and exterior of the equipment shall be free from visual defects.

3.05 TESTING

A. Upon completion of the installation, the Contractor will demonstrate the performance of all furnished equipment to ensure compliance with the manufacturer's performance specifications and the conditions described herein. The Contractor shall furnish the services of a competent and experienced factory representative who has complete knowledge of proper operation and maintenance of the chemical treatment system equipment who shall be present at the jobsite to inspect and approve the final installation and to supervise a test run of all equipment furnished for the minimum man-days listed for the services shown below, travel time excluded:

1. ½ man-day for installation assistance, inspection, and certification of the installation.
2. ½ man-day for functional and leak testing/training.

B. If the performance of any item of equipment does not meet the requirements specified, the chemical treatment equipment manufacturer shall take measures to correct, remove, or replace the unit with one that satisfies the conditions specified, at no additional cost to the owner. Any equipment failing the first field test shall be adjusted and re-tested. If the equipment fails a second test, the equipment will be rejected and the Contractor shall furnish a second unit that will perform as specified.

C. The Contractor shall furnish all instruments and labor for the testing and calibration.

D. Proper notice shall be given to the Engineer and City as to when the field-testing shall take place. The Contractor shall coordinate and assist a programmer from City with testing, since signals will need to be sent to the equipment from the PLC program to prove proper equipment operation in automatic mode. The Engineer shall witness all field testing.

E. All tests shall be conducted using water in lieu of chemical. Chemical will not be introduced to the system and tested until the OAT test, as stated in SECTION 15950 – PERFORMANCE TESTING AND FACILITY STARTUP.

F. The chemical treatment system shall be tested in all operating scenarios (manual, run, off, auto, etc.)

G. When testing in auto mode, a 4-20 mA control signal shall be sent from the PLC to simulate a flow-pacing signal. The Contractor shall check the pump at 10%, 25%, 50%, and 100% speed to verify that each pump responds to a range of remote speed signals.

H. When testing in manual mode, the Contractor shall manually adjust the pump stroke and speed throughout the range to verify that each pump operates properly and pumps per the maximum nameplate rating.

I. Upon satisfactorily testing as described above, the Contractor shall verify that each pump shuts down and sends an alarm to the PLC when no flow is detected during operation of the pump. To test this device, the flow monitor cord shall be unplugged from the flow monitor input on the pump housing. With the flow monitoring option on the pump enabled, the Contractor shall start the pump again in remote by sending a signal from the PLC. The Contractor shall verify that the pump alarms and shuts down after the programmed number of pump pulses has occurred. The pump pulse alarm setting will be programmed during startup based on City's requirements.

3.06 TRAINING

A. A factory representative who has a complete knowledge of the proper operation and maintenance of the each sodium hypochlorite chemical treatment system shall be provided at the City's request to instruct representatives of the City on proper operation and maintenance of the equipment. This work may be conducted in conjunction with the inspection of the installation and testing. If there are difficulties in operation of the equipment due to the manufacturer's design of fabrication, additional service shall be provided to correct all difficulties at no cost to the City.

B. See SECTION 01735 – TRAINING REQUIREMENTS for training requirements.

3.07 WARRANTY

A. The Contractor shall furnish a three (3) year warranty for all work covered by this Section. Refer

SECTION 01738 – WARRANTIES AND BONDS for additional warranty requirements.

PART 4 – MEASUREMENT AND PAYMENT

All work as specified herein, satisfactorily completed, shall be paid for on a Lump Sum basis as stated in **Bid Item Schedule** for the item listed below:

Bid Item No. 20 – CHEMICAL TREATMENT SYSTEM

-END OF SECTION-

SECTION 15145 - DISINFECTION OF WELL, PUMP AND PIPING

Bid Item No. 21

PART 1 - GENERAL

1.01 SCOPE

A. This section covers the work necessary to disinfect all well, pump, water main, station piping and other piping facilities.

PART 2 - MATERIALS

2.01 DISINFECTANT

A. Disinfectant shall be liquid sodium hypochlorite (chlorine) at 12.5 percent available, for the well and pump. Calcium hypochlorite tablets or liquid sodium hypochlorite shall be used to disinfect the water mains.

B. Certification with NSF Standard 60 shall be provided by the National Sanitation Foundation for all disinfectant added to the drinking water including raw water to be treated.

2.02 DECHLORINATION AGENT

A. The dechlorination agent shall be in tablet or liquid form. Only one type of dechlorination agent shall be used during dechlorination activities. Dechlorination agent shall be any of the following chemicals: sodium thiosulfate, sodium sulfite, sodium bisulfite, sodium metabisulfite, calcium thiosulfate, ascorbic acid, or sodium ascorbate.

PART 3 – EXECUTION

3.01 DISINFECTION OF WELL AND WELL PUMP

A. Prior to delivery to the site, the Contractor shall clean all column pipe sections and pump assembly and all other components to be installed in the well with a hot-water high-pressure cleaner. If the Engineer requires additional cleaning measures, the Contractor shall pressure wash the pumps using a solution containing trisodium phosphate with use of an appropriate BMP approved by the Engineer for containment of cleaning solution. The Contractor shall cover and protect the column pipe sections and pump assembly if they are not installed on the same day they are delivered to the site.

B. All permanent equipment and material to be installed in the well shall be chlorinated during installation. This shall be done by spraying all areas of permanent equipment (pump, column, etc.) with a solution having a chlorine residual of not less than 200 mg/L (200 ppm).

C. Immediately prior to disinfection and bacteriological testing and after the well pump has been installed and is operable, the Contractor shall run the pump at the design flow rate to waste for a 2-hour minimum period or longer if visual evidence suggests discharge water is not free of solids. The pump waste flow shall not exceed the design flow rate specified in SECTION 15130 – VERTICAL TURBINE PUMP COMPONENTS.

D. After the well pump has been run to waste the well shall be disinfected in accordance with the procedures specified in AWWA C654 and as specified herein. The Contractor shall add sufficient disinfectant to the well to reach a chlorine residual of not less than 50 mg/L (50 ppm) which takes into account the well casing size, gravel pack (if present) and water column. Prior to the introduction of the chlorine solution, the Contractor shall verify all quantities with the Engineer. The liquid disinfectant shall be added through a suspended tube (tremie pipe), directed either through the discharge head or the well air vent pipe assembly. The liquid chlorine solution shall be evenly distributed through the well by withdrawing the tube from the bottom of the well as the liquid chlorine solution is pumped through the tube. Prior to the introduction of the chlorine solution, the Contractor shall verify all quantities with the Engineer.

E. After the chlorine has been applied, the well shall be surged at least three times to improve mixing and induce contact of the chlorinated water with the adjacent aquifer. The chlorinated water shall be allowed to rest in the casing for 24 hours. After 24 hours, the well pump shall be started and pumped to waste. The chlorine residual shall be measured immediately upon discharge and recorded. If the chlorine residual is less than 25 mg/L (25 ppm), the Contractor shall flush the well for not less than 1 hour. The well shall then be rechlorinated again to 50 mg/L (50 ppm) and this step shall be repeated until the chlorine residual is measured above 25 mg/L (25 ppm)

F. Any oil or other significant contaminant pumped from the well must be collected for proper disposal. See SECTION 15950 – PERFORMANCE TESTING AND FACILITY STARTUP for discharge specific discharge requirements of chlorinated water, dechlorinated water and solids to the storm drain or sanitary sewer.

G. Once the 24-hour chlorine residual is measured above 25 mg/L (25 ppm), the well water shall be pumped to waste for at least 15 minutes or longer until zero chlorine residual is measured. The Contractor shall then coordinate with the City to collect a bacteriological sample for laboratory analysis. Lab testing will be paid for by the City.

3.02 DISINFECTION OF WATER MAINS

A. After all other work has been completed, hydrostatic pressure and leakage tests have been passed, and prior to placing in service, all water lines shall be completely disinfected in accordance with the *Continuous-Feed Method* outlined in AWWA C651 as specified herein. Other disinfection methods contained in AWWA C651 may be used at the approval of the Engineer.

B. Prior to chlorination, the water main shall be flushed as thoroughly as possible using corporation cocks, drain valves or other suitable valves, acceptable to the Engineer. However, if calcium hypochlorite tablets are attached to the pipe at the time of installation for purposes of sterilization, it will not be possible to flush the main prior to disinfection. It shall therefore be necessary to exercise extreme care to keep the pipe clean during installation. The Contractor shall furnish and install temporary disinfection equipment and supplies (hoses, temporary piping, etc. as required) to dispose of flush water without damage to adjacent properties.

1. **Disinfection**
   Inject the chlorine mixture into the pipeline to be treated at the beginning of the line through a corporation stop or suitable tap in the top of the pipeline. Water shall be controlled so as to flow slowly into the piping during the application of chlorine. The rate of chlorine mixture shall be in proportion to the rate of water entering the pipe so that the combined mixture shall contain 25 mg/L (25 ppm) of free available chlorine.

2. **Retention Period**
   Chlorinated water shall be retained in the pipeline long enough to destroy all non-spore-forming bacteria. This period shall be at least 24 hours. After the chlorinated water has been retained for at least 24 hours, the chlorine residual at the pipe extremities and at the other representative points shall be at least 10 mg/L (10 ppm).

3. **Chlorinating Valves**
   During the process of chlorinating the piping and pipelines, all valves and other appurtenances shall be operated while the pipeline is filled with the chlorinated water.

4. **Final Flushing**
   Following chlorination, all treated water shall be thoroughly flushed from the pipes and pipelines until the replacement water shall, upon testing, both chemically and bacteriologically, be proven equal to the water quality at the point of supply. Chlorination shall be repeated, if necessary, by the Contractor at no additional cost to the City, if the replacement water does not prove equal to the water quality at the point of supply.

C. The number of calcium hypochlorite tablets used shall be in accordance with the following table from AWWA C651, which is based on 5-gram calcium hypochlorite tablets for a dosing of 25 mg/L (25 ppm). The number of 5-gram tablets required for each pipe section shall be $0.0012d^2L$ rounded to the next higher integer, where d is the inside pipe diameter, in inches, and L is the length of the pipe section, in feet.

 # OF 5-GRAM $Ca(ClO)_2$ TABLETS REQUIRED PER PIPE LENGTH

	Pipe Diameter					
Length of Pipe Section	**4"**	**6"**	**8"**	**10"**	**12"**	**16"**
13’ or less	1	1	1	2	3	4

18’	1	1	2	3	4	6
20’	1	1	2	3	4	7
30’	1	2	3	4	6	10
40’	1	2	4	5	7	13

D. Prior to acceptance of the system by the City, all pressurized mains shall be thoroughly flushed and successfully tested for bacteriologic quality. The Contractor shall coordinate with the City to collect a bacteriological sample for laboratory analysis. Lab testing will be paid for by the City.

3.03 FINAL CONNECTION TO DISTRIBUTION SYSTEM

A. After cleaning, disinfecting, and testing, the new pipeline shall be connected to the existing pipeline in accordance with AWWA C651, 4.6. The connection spool and fitting shall be swabbed with a minimum 1 to 5-percent solution of chlorine just prior to being installed.

3.04 DISCHARGE REQUIREMENTS

A. The Contractor shall properly dispose of flush water in a manner that will not cause damage and nuisance to the environment. Non-chlorinated flush water shall be disposed of as directed by the Engineer. Otherwise, the Contractor shall dechlorinate the flush water completely and discharge it to the nearest storm drain or drainage channel in a manner which shall not cause erosion or other environmental problems. Refer to SECTION 15950 – PERFORMANCE TESTING AND FACILITY STARTUP for specific discharge requirements.

3.05 BACTERIOLOGICAL TESTS

A. After final flushing and before the pump and water mains are placed in service, the well and water mains shall be sampled by the City and tested for coliform organisms and iron bacteria in accordance with "Standard Methods for the Examination of Water and Wastewater.”

1. Contractor shall coordinate bacteriological testing with the City. Samples shall be collected by the City from the station piping, from the downhill end of the water main. No hose or fire hydrant shall be used in collection of samples.

2. Test results shall show the absence of coliform organisms.

3. The City will conduct the laboratory tests at no cost to the Contractor. If the initial disinfection fails to produce satisfactory bacteriological samples, the Engineer shall evaluate the results and direct the Contractor to take corrective actions.

4. The Contractor shall be responsible for any time delay and pay all costs incurred for retesting and any corrective actions taken.

PART 4 – MEASUREMENT AND PAYMENT

All work as specified herein, satisfactorily completed, shall be paid for on a Lump Sum basis as stated in **Bid Item Schedule** for the item listed below:

Bid Item No. 21 – DISINFECTION OF WELL, PUMP, TANK AND PIPING

-END OF SECTION-

SECTION 15300 - FIRE PROTECTION SYSTEM

Bid Item No. 22

PART 1 – GENERAL

1.01 DEFINITIONS

A. Pipe sizes used in this Section are nominal pipe size (NPS) specified in inches.

B. Working plans as used in this Section refer to documents (including drawings and calculations) prepared pursuant to requirements in NFPA 13 for obtaining approval of authority having jurisdiction.

C. NICET - National Institute For Certification In Engineering Technologies

D. Other definitions for fire protection systems are included in referenced NFPA standards.

1.02 DESCRIPTION OF WORK

A. The work includes designing, providing and installing a complete and fully operable automatic sprinkler system as described in this Section of the Specification and as shown on the contract construction drawings and shall be in accordance with rules, regulations and standards as required by the following authorities having jurisdiction.

1. State of California.

2. City of Morgan Hill Building Department.

3. Fire Prevention Division, Fire Marshal's Office.

4. Santa Clara County Fire Department.

B. Work to be in accordance with criteria of the following design and installation standards:

1. National Fire Protection Association.

   a. No. 13 – Installation of Sprinkler Systems.
   b. No. 24 - Private Fire Service Mains.
   c. No. 70 - National Electrical Code.
   d. No. 101-Life Safety Code.

2. Uniform Fire Code (UFC), with latest amendments.

3. California Building Code (CBC)

4. Uniform Building Code (UBC)

5. Underwriters Laboratories, Inc.

6. Industrial Risk Insurance Underwriters.

7. City's insurance agency.

C. Work includes but is not limited to the following:

1. Automatic Wet Type Sprinkler System to serve the pump and chemical rooms.

2. Provide all pipe, fittings, sprinklers, valves, signs, flow switches, tamper switches, protective painting, test connections, drains and tests necessary to make the entire system complete and operative.

3. Coordinate with plumbing Contractor for capacity of sprinkler main, test, and auxiliary drain connections.

4. Valve tags and instruction plates shall be mounted and/or hung per local fire department requirements.

5. All sleeves and inserts.

6. All trenching and backfilling, including culverts under rails and guard posts where required.

7. 1-1/4", or larger, riser drain shall be provided adjacent to each standpipe riser for testing of fire department pressure reducing valves.

8. Provide hose valve with cap downstream of sprinkler system pressure reducing valves for the purpose of testing (per NFPA 13). Hose valve shall be sized to provide full flow through pressure reducing valve.

1.03 SUBMITTALS

A. Product Data: Submit four copies of manufacturer's technical data and installation instructions for fire protection materials and products.

1. Thirty days after the awarding of contract, Contractor shall submit list of manufacturer's names and model numbers for review and comment. This list shall identify any prior approved substituted items Contractor wishes to use. Do not submit technical data until list has been approved. This is mandatory.

2. Prior to construction submit for review, comment and approval items including but not be limited to the following:

    a. Coordinated layout drawings. Lettering shall be minimum 1/8" high.
    b. Sprinklers and escutcheons - designating area of use.
    c. Valves, valve boxes, flow switches, and tamper switches.
    d. Provide California State Fire Marshal approval numbers for flow switches and tamper switches.
    e. Pipe, fittings, sway bracing, inserts, anchors and hangers.
    f. Inspector's test and drain station.
    g. Hose valves, pressure relief valves, and pressure reducing valves.

B. Working Plans: Prepare scaled working plans for fire protection pipe and fittings including, but not necessarily limited to, pipe and tube sizes, locations, and elevations and slopes of horizontal runs, wall and floor penetrations, and connections. Indicate interface between and spatial relationship to piping and adjacent equipment.

    1. Spacing of fire sprinklers shall be coordinated with lights and other architectural features; and sprinkler piping shall be coordinated with piping, plumbing, electrical conduit, cable trays and structure prior to the installation. Drawings shall be composite type including piping and electrical equipment with sprinkler and sprinkler drain piping.

C. Submittal Drawings: Submit shop drawings to Agency having jurisdiction for approval, the Santa Clara County Fire Department. Submit four approved copies, bearing stamp and/or signature of authority having jurisdiction to the Engineer for review, comment and approval.

    1. Contractor shall submit sprinkler head locations for approval.

    2. Each calculation shall include legible schematic of system showing all hydraulic reference points.

D. Hydraulic Calculations: Prepare hydraulic calculations of fire protection systems. Submit to authority having jurisdiction for approval. Submit four approved copies, bearing stamp, and/or signature of Agency having jurisdiction to City's representative for review, comment and approval.

    1. Contractor shall submit published piping friction loss data from manufacturer with hydraulic calculations.

E. Certificate of Installation: Submit certificate upon completion of fire protection piping work, which indicates that work has been tested in accordance with NFPA 13, and also that system is operational, complete, and has no defects.

F. Maintenance Data: Submit maintenance data and parts lists for fire protection materials and products. Include this data, product data, shop drawings, approval drawings, approval

calculation, certificate of installation, and record drawings in maintenance manual; in accordance with requirements of the General Conditions and of SECTION 01730, OPERATION AND MAINTENANCE DATA.

G. Operating and Maintenance Instructions: Provide the City with three sets of operating and maintenance instructions covering completely the operation and maintenance of sprinkler equipment and controls. The Contractor is responsible for proper instruction of City's personnel for operation and maintenance of all material, equipment and apparatus provided. Manual shall be assembled in a 3-ring binder and arranged in following sections:

1. Site Utilities: Drawings showing location, size, depth of all connections, valve boxes, etc., as installed.

2. Section No. 1: A chart tabulating all types of pipe fittings, valves, and piping specialties installed in each system.

3. Section No. 2: Manufacturer's brochures of all sprinkler heads.

4. Section No. 3: Tamper switches and flow switches.

5. Section No. 4: Reproducible copies of approved working drawings prepared to facilitate the actual installation of piping.

6. Section No. 5: Approval Calculations.

7. Section No. 6: Certificate of Installation.

8. Section No. 7: Guarantees.

1.04 DESIGN DESCRIPTION

A. This section of the specification combined with any of the contract drawings are intended as a guide to establish a basis of design for the systems required.

B. Contractor shall examine Civil, Structural, Plumbing, and Electrical drawings, layout and install a completely hydraulically sized sprinkler system for all areas. Space shall be provided for any valving and equipment to be used.

1. System shall start 5'-0" from perimeter wall and extend throughout the building. Fire main beyond 5'-0" perimeter is provided under Division 2 work.

2. Contractor shall contact City’s insurance agency to incorporate insurer’s design requirements in this layout document.

C. Rooms to be sprinklered include the Sodium Hypochlorite and pump rooms. These two rooms shall be served with a wet type sprinkler system. A main riser shall be located in the pump Room.

D. Base Building construction shall include upright heads.

E. Pressure restricting devices shall be installed on any branch outlet exceeding 100 PSI.

F. Seismic Requirement: All automatic sprinkler systems to be seismically braced for California and NFPA 13. Submit shop drawings on methods and materials.

   1. Do not use NFPA Earthquake Zone Chart.

1.05 HYDRAULIC DESIGN

A. System shall be a straight line or gridded system per NFPA No. 13 with the following exceptions:

   1. For all systems the design area shall be the hydraulically most demanding rectangular area.

   2. Minimum pressure for any sprinkler head shall not be less than 7 psi.

B. Safety Factor: 10 Psi, or 10 percent of static and residual pressure, whichever is greater.

C. Ordinary Group II Hazard Areas: Water density of 0.20 GPM per square foot calculated for an area of 1500 square feet in the most remote locations.

D. Head spacing shall not exceed the limits described in NFPA Pamphlet No. 13.

   1. Ordinary Hazard: 130 sq. ft.

E. Flow Data: Contractor is to verify flow data (static pressure, residual pressure and GPM flowing) available at site and provide design for available pressure and flow.

1.06 QUALITY ASSURANCE

A. The Contractor for the fire protection installation shall be duly qualified Fire Protection Contractor, experienced and regularly engaged in the installation of fire protection systems with a license classification of C-16. Where local authorities require additional licensing of the Fire Protection Contractor, and/or workmen, such a license shall be mandatory for a prospective Contractor.

   1. Contractor is to verify flow data (static pressure, residual pressure and GPM flowing) available at site and provide design for available pressure and flow.

2. The Fire Protection Contractor shall be the Engineer of Record for the automatic sprinkler.

3. Permits - The Fire Protection Contractor shall obtain permits for the installation or construction as required for approval and installation of the fire protection system. The Fire Protection Contractor shall submit working plans to the authorities having jurisdiction to obtain approval.

1.07 GUARANTEE

A. Provide a one-year (12 months) guarantee under provisions of Division 1. The guarantee shall include parts, shipping, labor, travel costs, living expenses, required fees, and any other associated cost or expense to repair or replace products or systems. The guarantee period is to begin on the date of acceptance of the fire protection installation by the City.

PART 2 – PRODUCTS

2.01 GENERAL

A. All products to be commercial grade, new and of the manufacturer's latest design model. Products manufacturers outside of North America will not be accepted without written approval from engineer prior to submission of bid.

B. All products to be UL listed and/or FM approved, except for items, which are not required to be listed by code.

C. All products shall be delivered and stored in original containers. Containers shall be clearly marked or stamped with manufacturer's name and rating.

2.02 PIPE AND FITTINGS - ABOVE GROUND

A. General: The piping products listed below by manufacturer's name and model numbers are the only acceptable materials listed for this project. Substitutions of pipe must be submitted and approved in writing by the engineer prior to bid. No copper pipe shall be allowed in the wet fire sprinkler system.

B. Piping or fittings that show substantial rust or breaks in coating will be removed and replaced.

C. Allied Tube & Conduit: Schedule 40 black steel, ASTM A135 or ASTM A795 stamped on pipe, UV cured acrylic finish; Stockham, Grinnell or Warwick Class 150 threaded malleable, ASTM A197, ASTM A126, or Victaulic roll-grooved fittings and couplings, only.

D. Shop-weld thread-o-lets may be used in lieu of tee fittings, but field (site) welding will not be permitted.

E. Mechanical Couplings: Victaulic grooved couplings style 07, 75 or 77, or equal by Gruvlok.

F. Mechanical Tees: Victaulic style 920, Gruvlok. U-bolt mechanical tees are not acceptable.

G. Flexible sprinkler connector for ductwork sprinkler application: Flexhead or equal Factory Mutual approved system.

H. Use rigid couplings where flexibility is not required or provide necessary sway bracing.

I. Prohibited Piping and Fittings: Copper pipe, CPVC pipe, schedule 5, 10, 20, 30, Super 40, "Dyna-Flow", "Dyna-Thread", "Fireflow", XL, Thinwall, "Eddylite" by Bullmoose and Threadable Lightwall pipe are not allowed. POZ-LOK, U-bolt Victaulic style 921 mechanical tees, Victaulic style 99 Roust-A-Bout, Victaulic style 90 Plainlock, Hooker style fitting, quick disconnect, boltless, snap-joint, field drilling or welding of any main or branch lines, and any device specifically prohibited by the local authority having jurisdiction is not allowed. No unions shall be permitted for any size pipe. Plain end fittings are not allowed.

2.03 PIPE AND FITTINGS – UNDERGROUND

A. Class 52 ductile iron pipe and fittings, white, cement lined, mechanical or Tyton joint fittings. Piping to be factory encased with 8 mil polyethylene tube or sheet. Fittings to be double field wrapped with 2" wide, 20 mil vinyl tape, 50% overlap.

B. Manufacturer: United States Pipe and Foundry, Griffin or Pacific States, only.

C. Polyvinyl Chloride (PVC) Plastic Pipe:

1. Pipe and fittings: Pipe shall conform to AWWA C900 and shall be plain end or gasket bell-end, pressure Class 150 with cast-iron-pipe-equivalent OD. Fittings shall be gray-iron or ductile-iron conforming to AWWA C110, and shall have cement lining conforming to AWWA C104, standard thickness.

2. Joints and Jointing Material: Joints for pipe shall be push on joints as specified in ASTM D3139. Joints between pipe and metal fittings, valves, and other accessories shall be push on joints as specified in ASTM D3139 or shall be compression type joints / mechanical joints as respectively specified in ASTM D3139 and AWWA C111. Provide each joint connection with an elastomeric gasket suitable for bell or coupling or push-on joints with which it is to be used.

3. Transition from PVC to ductile iron pipe shall occur a minimum of 5 feet from building.

D. All underground piping for fire mains shall be installed, clamped, anchored, flushed and hydrostatically pressure tested according to the requirements of the authorities and/or agencies having jurisdiction, and NFPA Pamphlets Nos. 13 and 24 and F. M. Handbook of Industrial Loss Prevention.

E. Anchor underground riser stub to nearest underground connection by means of rodding. Retaining glands with setscrews above grade are not allowed.

2.04 SPRINKLER HEADS – GENERAL

A. Sprinkler heads shall be regular automatic closed-type heads of ordinary degree temperature rating except that sprinkler heads installed in the vicinity of heating equipment or in special occupancy areas shall be of the temperature rating as described in NFPA No. 13.

B. Provide corrosion-resistant sprinkler heads.

C. The Contractor shall furnish two spare heads. The heads shall be packed in a suitable container and shall be representative of, and in proportion to, the number of each type and temperature rating head installed. In addition to the spare heads, the Contractor shall furnish not less than two special sprinkler head wrenches. Refer to NFPA 13 section; "Stock of Spare Heads".

2.05 SPRINKLER HEADS AND ESCUTCHEONS

A. Sprinkler heads installed shall be upright or pendent, as conditions require, and shall be of the following type and finish for the areas designated. Unless otherwise specified, sprinklers shall be small frame type, center bulb capsule for finished areas, fusible link for unfinished areas, and ½" orifice.

Building Area	Sprinkler Head	Sprinkler Finish	Escutcheon Finish	Temp. Deg.
Chemical and Pump Rooms	Upright/Pendent	Brass	None	165°F

B. Manufacturer: Reliable, Star or Viking.

2.06 VALVING

A. 2" or Smaller:

1. Control Valve: OS&Y rising stem type gate valve bronze body, bonnet and disc, copper alloy stem, threaded ends, 175 PSI WOG min. Provide with tamper switch.

2. Check Valve: Swing check type with bronze body, cap and disc, threaded ends, 175 PSI WOG min.

3. Drip Valve: 3/4", cast brass automatic ball drip type, threaded ends, 175 PSI WOG min.

4. Testing Valve: 1-1/4", test and drain, sight glass, ½" test orifice, lever operated, 300 psi WOG. Drain to mop sink or drain riser.

5. Main Drain Valve: 2", angle gate valve, bronze body, copper alloy stem, threaded ends, 175 psi WOG. Drain to mop sink or drain riser.

B. 2-1/2" or Larger:

1. Control Valve: Lug type wafer valve with tamper switch, ductile iron body, nickel plated ductile iron disc, stainless steel stem and Buna-N seat, 175 PSI WOG min.

2. Control Valve: OS&Y rising stem type gate valve, cast iron body and bonnet, bronze stem, seat and disc, flanged ends, 175 PSI WOG min. Provide with tamper switch.

3. Check Valve: Swing check type with cast iron body, bolted cap and disc, flanged ends, 175 PSI WOG min.

4. Manufacturer: Grinnell, Stockham, Milwaukee, Mueller, Kennedy, Elkart or AGF.

2.07 WET SPRINKLER ALARM CHECK VALVE

A. Contractor shall provide, where required, a completely engineered horizontal wet alarm check valve, retarding chamber, and trim assembly. Viking #H-2, Star or Reliable.

2.08 UNDERGROUND WATER VALVE

A. Resilient seated gate, valve, non-rising stem, 2" square valve nut, ductile iron construction with epoxy coated surfaces, both interior and exterior, 250 PSI, mechanical joint ends. Provide yard box and cover.

B. Manufacture: American Darling, Clow, Dresser, or U.S. Pipe.

2.09 VALVE BOXES

A. Cast iron valve boxes for shutoff valves buried in ground shall be complete with bellbottoms, extension piece, top and cover. Boxes shall be suitable for the types of valves with which they are used. All valve boxes shall have a concrete collar flush with grade.

B. Lids shall have the applicable letters embossed upon the top surface. Tagging shall match existing lids.

C. Manufacturer: Tyler, ITT Grinnell, or equal.

2.10 PRESSURE REDUCING VALVES

A. Sprinkler System: Rough bronze body with red enameled hand wheel with integral check valve of the pressure reducing type. Outlet pressure shall not exceed 165 PSI at maximum system pressures. Pressure settings to be field adjustable.

   1. Manufacturer: Zurn #Z-3004

B. Fire Service: 150 class pressure rating, cast iron body with brass main valve trim, control system cast bronze with stainless steel trim

   1. Manufacturer: Cla-Val #90-21UL.

2.11 PRESSURE RELIEF VALVE

A. Provide 3/4" pressure relief valve on discharge side of Sprinkler system pressure reducing valve. Set to a maximum of 175 PSI.

   1. Manufacturer: Zurn #P1000A.

2.12 BACKFLOW PREVENTER

A. Provide listed backflow prevention device as required by local codes and ordinances. Backflow prevention devices installed in the vertical position shall be approved for that orientation.

B. Double check detector check valve assembly: Epoxy coated, ductile iron construction, 175 Psig working pressure, complete with two spring loaded "Y" type check valves, "Y" strainer with hose bibb on suction side of assembly, two OS&Y gate valves, test cocks, bypass water meter and bypass doublecheck. Ames Model 3001SS, Febco #856-DCDA, Watts #709-DCDA-OSY, Wilkins #950DA or approved equal

C. Reduced pressure backflow preventor: Ductile iron construction, 150 Psig working pressure, complete with two spring loaded "Y" type check valves, "Y" strainer with hose bibb on suction side of assembly, one differential relief valve, two OS&Y gate valves and test cocks. Unit shall be tapped on both sides to accommodate installation of test cocks. Febco #860 RPA, Wilkins #975DA, Watts #909-RPDA or approved equal.

D. Detector check valve assemblies: Ductile iron construction, 150 psig working pressure, complete with spring loaded check valve, two OS&Y gate valves and four test cocks. Febco #800 or approved equal.

2.13 INTEGRAL INSPECTORS ALARM TEST AND SYSTEM DRAIN

A. Combination system drain and visible orifice insert/sight glass for testing system alarm; with screwed or grooved inlet and outlet connections, Malleable iron hand wheel, EPDM valve seats, maximum working pressure 300 Psi, 1/2" orifice insert, Bronze housing, UL listed and FM Approved. Victaulic TestMaster II style 720, or approved equal.

B. Water pressure gauge, range 0-300 Psi, in 5 Psi increments, brass case - 3-1/2" diameter, 1/4" NPT male pipe connection, UL listed. Locate pressure gage on riser per code. Star Sprinkler, Ashcroft or approved equal.

C. Pressure gauge test valve, brass 1/4" screwed ends, 300 Psi WOG. United or approved equal.

D. All relief, main, auxiliary and equipment drains shall be routed separately to floor drain or air gap fitting (by plumbing).

2.14 TAMPER SWITCHES

A. Switch shall be mounted so as not to interfere with normal operation of the valve and be adjusted to operate when handle of valve has traveled more than one-fifth the distance of its normal operating position. Electrical Contractor shall provide conduit from switch to fire alarm panel.

B. Housing shall be of aluminum, acid-treated, primed and finished in baked red enamel. Removal of housing shall cause switch to operate. Inside shall be single pole, double throw micro switch with connection for electrical conduit.

C. Install on all control valves.

D. Manufacturer: Potter-Electric, Notifier, Ellenco, or Simplex.

2.15 WATER FLOW ALARM - VANE TYPE

A. Indicator shall be for either vertical or horizontal installation. Indicator shall not be installed in a fitting that changes direction of water flow and shall have a sensitivity setting to signal any flow of water that equals or exceeds the discharge from one sprinkler head. Provide retarding device to prevent false alarms from line surges.

B. Whenever a water flow alarm is installed in the piping system, an approved floor control valve shall be provided upstream of the alarm indicator. In addition, a drain is required downstream of the alarm indicator.

C. Each water flow alarm shall be wired to a Fire System. All wiring and conduits as required will be provided under Division 16. An alarm will automatically activate the local fire alarm system.

D. Manufacturer: Potter-Electric, Ellenco, Notifier, or Simplex.

2.16 EXTERIOR ALARM

A. Electric bell, 10" diameter, U.L. listed, weather-proof back box housing, 120 VAC, 99 dB at 10 FT; Potter model PBA12010 or equal.

B. Electric Horn: Potter-Electric, Ellenco, Notifier, or Simplex weatherproof, 120 VAC.

PART 3 – EXECUTION

3.01 GENERAL

A. This system to be installed by an experienced firm regularly engaged in the installation of automatic sprinkler system as specified by the requirements of the Specifications.

3.02 PERFORMANCE OF WORK

A. Examine areas and conditions under which materials are to be installed. Layout the system to suit the different types of construction and equipment as indicated on the drawings and in accordance with NFPA Pamphlet No. 13, 14, 20 and 24.

B. Work to start immediately after authorization has been given to proceed so that the overall progress of the construction is not delayed.

C. Coordinate with other trades as necessary to properly interface components of the sprinkler system.

D. Follow manufacturer's directions and recommendations in all cases.

E. The omission from the drawings or Specifications of any details of construction, installation, materials, or essential specialties shall not relieve the Contractor from furnishing the same in place for a complete system.

3.03 INSTALLATION

A. Fire protection system shall be installed in accordance with the approved Drawings.

B. Before connection to the overhead piping, all underground piping shall be flushed with water flowing at velocity and quantity required by the installation standards specified above in this Section of the Specifications.

C. The arrangement of all pipes shall conform to all architectural requirements and field conditions, shall be as straight and direct as possible, forming right angles or parallel lines

with building walls and other pipes, and shall be neatly spaced. Offsets will be permitted only where required to permit the pipes to follow the walls. Standard fittings shall be used for offsets. Riser shall be erected plumb and true, shall be parallel with the walls and other pipes, and shall be neatly spaced. All work shall be coordinated with Electrical and Structural work in order to avoid interference and unnecessary cutting of floors or walls. All underground or concealed work shall be inspected before the construction is closed up.

D. No pipes or other apparatus shall be installed so as to interfere in any way with full swing of doors.

E. The arrangement, positions, and connections of pipes, drains, valves, etc., shall be as required by NFPA 13 for all areas to be sprinklered. However, the right is reserved by the Engineer to change the location of any item to accommodate conditions, which may arise during progress of the work, without additional compensation for such changes provided that no additional heads are required prior to the installation of the work.

F. Where required, piping shall be installed concealed in building construction, or though steel beams, to obtain adequate head room.

G. All pipe throughout the job shall be reamed smooth before being installed. Pipe shall not be split, bent, flattened, or otherwise injured either before or during installation.

H. Provide protective pans under pipes passing over high voltage electrical bus duct or switchgear equipment. The pan shall be constructed of 12 gauge black iron with a 6 inch lip, the corners being welded to make the pans watertight. Each pan shall be given three coats of Rustoleum paint and shall be supported by pipe hangers. The pan shall drain clear of the bus duct or switchgear.

I. All pipe interiors shall be thoroughly cleaned of foreign matter before installation, and shall be kept clean during installation by plugging or other approved means. Piping shall be covered with visqueen during storage. Piping that shows signs of rusting will be removed from job site and replaced.

J. Field Connections: Any modifications to system required by field conditions, physical equipment changes or compliance with code regulations shall be made promptly without cost to City.

K. Interference: No piping or sprinkler devices shall interfere with the operations of any door, window and electrical systems.

L. Threaded Pipe: Threads shall be clean cut, standard and tapered. Threads shall be made up using flaked graphite and lubricating oil, piping compound or Teflon tape applied to the male threads only.

M. Grooved Pipe: Installation shall be as prescribed in the Victaulic Piping Manual only. Holes in the piping are to be made in the fabrication shop, not at the job site. Contractor shall provide at the project site a sample of each type of coupling (threaded, standard grooved coupling and mechanical type), showing complete assembly with pipe connections.

N. Keep all pipe and other openings closed to prevent entry of foreign matter. Cover all equipment and apparatus to protect against dirt, water, chemical or mechanical damage, before and during construction period. Restore to original condition all apparatus and equipment damaged prior to final acceptance, including restoration of damaged shop coats of paint.

3.04 HANGERS, INSERTS, SUPPORTS, AND SWAY BRACING

A. Hangers and supports shall be installed per NFPA 13 sections on Hangers and Protection of Piping Against Damage Where Subject to Earthquake. Provide restraint from movement at end sprinkler on branch line per NFPA 13.

3.05 SAFETY TESTING & VERIFICATION

A. Flush, test, and inspect sprinkler piping systems according to NFPA 13 Chapter "System Acceptance."

B. Provide NFPA 13 Contractor's Material & Test Certificate Form 85A for above ground piping and Form 85B for underground piping.

C. Provide manpower to test the function and performance of all Life Safety System components and devices per floor and per zone basis in accordance with the local requirements.

3.06 IDENTIFICATION

A. Provide hydraulic design data nameplates on the riser in accordance with NFPA 13

B. Equipment such as valves, drains, etc., shall be provided with signs that identify type of equipment and service. The tag shall be securely fastened to the handle or spindle of the valve by a brass chain.

3.07 AS-BUILT RECORD DRAWINGS AND CERTIFICATION

A. As-built drawings are to be kept up-to-date and the master copy kept at the job site. Prior to final acceptance of work being approved, these drawings are to be turned over to the City's representative for approval.

B. Written certification from the insuring agents, and authorities having jurisdiction that the tests were satisfactory.

C. After installation is complete and tests satisfactorily approved, deliver test certificates and approval by the local Fire Authorities and the FMA to the Engineer. Final acceptance of sprinkler/standpipe system by City's representative shall be contingent upon receipt of certificate and approval from authorities having jurisdiction and for the delivery of final as-built drawings.

PART 4 – MEASUREMENT AND PAYMENT

All work as specified herein, satisfactorily completed, shall be paid for on a Lump Sum basis as stated in **Bid Item Schedule** for the item listed below:

Bid Item No. 22 – FIRE PROTECTION SYSTEM

-END OF SECTION-

SECTION 15700 - VENTILATION

Bid Item No. 23

PART 1 – GENERAL

1.01 SCOPE

A. This Section covers the work necessary to furnish and install a wall fan, floor mounted blowers, acoustical louvers as well as other ventilation components specified herein, complete. The Contractor shall furnish all labor and materials needed to complete the work included in this section, complete. The Contractor shall refer to SECTION 10050 – BUILDING and the Drawings for additional information and details.

1.02 DESIGN REQUIREMENTS

A. Design and provide seismic anchorage and bracing for all equipment, whether shown or not. Provide seismic restraint to prevent permanent displacement in any direction caused by lateral motion, overturning or uplift.

PART 2 – MATERIALS

2.01 CHEMICAL FEED ROOM FLOOR-MOUNTED BLOWER

A. The Contractor shall furnish and install two corrosive resistant direct drive electric radial blowers as well as all ducting and rain caps for the chemical feed rooms. Blowers shall include the following:

1. The motor shall be 1/2 horsepower, 115-volt single phase, 1725 RPM, fan cooled. The fan/motor shall have a polypropylene wheel, fiberglass housing, with a 278 CFM blower capability at a static pressure of 1 inch of H_2O.

2. Fan housing shall be constructed of Ashland Hetron 693 polyester resin and glass fiber with 3% antimony trioxide added to achieve Class I flame spread below 25. Fan construction shall conform to ASTM D4167 for fiber reinforced plastic fans and blowers. All fiberglass surfaces shall be protected with a minimum 10 mil thickness of chemical, flame, and ultraviolet resistant resin. The entire housing shall have a finish coat of resin to provide superior protection and smooth air flow. All airstream hardware shall be 304 stainless steel.

3. Fan shaft shall be ground and polished carbon steel with an FRP wheel hub extending through the housing.

4. The blower shall be equipped with a flexible connector fitted to a rigid 8-inch diameter

PVC duct and PVC rain cap, ducted through the ceiling and roof as shown in the Drawings. The fan shall be configured to direct air upward (upblast arrangement).

5. The blower shall be equipped with a drain (½ inch fiberglass half coupling assembled in the blower housing).

6. Anchor bolts shall be Type 316 stainless steel, quantity, insert, and size by manufacturer.

7. Fans shall be connected to door switches that turn the fans on when door is open, off when closed. Manual over-ride switches shall also be provided on the exterior wall.

8. The blowers shall be manufactured by Hartzell Fan Inc. Model # A42-4-10-F100FG__F3, or approved equal.

2.02 WALL MOUNTED FAN

A. The Contractor shall furnish and install wall mounted fan units at locations indicated in the Drawings. Fans shall be a wall mounted, direct driven propeller exhaust fan with integral housing, shutter and inlet guard. Fans shall include the following:

1. The fans shall be of bolted and welded construction utilizing corrosion resistant fasteners. The motor shall be mounted on a 12-gauge steel wire guard. The wire guard shall be bolted to a minimum 14-gauge wall panel with continuously welded corners and an integral venturi. Fan shall be enclosed in minimum 18-gauge galvanized steel wall housing with factory installed shutter and inlet guard.

2. Unit shall bear an engraved nameplate. Nameplate shall indicate design CFM and static pressure.

3. All ungalvanized steel fan components shall have an electrostatically applied, baked polyester powder coating. Propeller shall have aluminum blades riveted to a painted steel hub. Propeller shall be balanced in accordance with AMCA Standard 204-96, Balance Quality and Vibration Levels for Fan.

4. Motor shall be 115V, single phase, 60 Hz, ¼ horsepower, open drip proof type with permanently lubricated sealed bearings.

5. The unit shall be provided with a mechanical, commercial grade thermostat

6. The unit shall be provided with a fan speed controller to adjust the fan speed. Fan shall be rated to 1969 cfm @ 0 inches of water column static pressure.

7. Fans shall be a Model 14XP32D132, as manufactured by Loren Cook Company of Springfield, Missouri, or approved equal.

2.03 ROOF MOUNTED TURBINE VENTS

A. The Contractor shall furnish and install roof-mounted vents at locations indicated in the Drawings.

2.04 ACOUSTICAL LOUVERS

A. The concrete block building is designed with two 1 ft x 4 ft sized acoustical louvers. Acoustical louvers shall have a minimum 50% free area. The submitted acoustical louvers must be approximately this size. Any deviation that requires altering the dimensions of the building must be submitted to the Engineer in writing for approval before construction.

B. The acoustical louvers shall be capable of limiting the noise produced by the pump station to 50 dBA at 10 feet directly in front of the louver. The acoustical louvers shall be designed by a company that specializes in sound attenuation. The acoustical louver design shall be accompanied with a chart or graph that displays the expected noise reduction for frequencies in the dBA scale. A letter shall also be submitted from the manufacturer stating that the louvers will meet the 50 dBA at 10 feet requirement.

C. Louver blades shall be acoustical on a 45-degree angle with 6 lb. per cubic foot mineral wood filler between 20 gauge galvanized face and 22 gauge galvanized perforate. Frame shall be 6" deep 16 gauge galvanized. Screen shall consist of ½" mesh 19 gauge galvanized in removable frame mounted on interior. Louver shall be finished with Polyurethane Enamel, Kynar 500, or another finished selected from NCA's standard color chart. Louvers shall be tested per AMCA standard 511 for water and air and ASTM E 90-97 for acoustics, and perform as per NCA specifications. Louver size and locations are as shown on plans. The Contractor shall furnish and install model ACSLJ-6 louvers, manufactured by NCA Manufacturing.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Wall Fan

The fan coil shall be ceiling-mounted inside the main control room of the pump station building. Contractor shall follow manufacturer's instructions to minimize vibration. Installation shall be performed by a licensed, qualified mechanical contractor experienced in the installation of air conditioning systems. Installation shall adhere to the manufacturer's instructions and pertinent local building codes. Use only factory-authorized parts and materials.

Air flow shall be set such condensate will not be blown from the drain pan.

Contractor shall install a secondary drain pan on the underside of the fan coil unit to ensure that no condensate is allowed to drip from the unit.

Vanes shall be positioned to direct air towards the greatest heat load.

B. Thermostat

Thermostat shall be installed on the inside wall of the main control room near the exit. The thermostat shall be set to maintain an ambient room temperature of 75°F.

3.02 TESTING

A. The Contractor shall test all components specified herein as required by the manufacturer and as specified in the electrical drawings and specifications.

PART 4 – MEASUREMENT AND PAYMENT

All work as specified herein, satisfactorily completed, shall be paid for on a Lump Sum basis as stated in **Bid Item Schedule** for the item listed below:

Bid Item No. 23 – VENTILATION

-END OF SECTION-

SECTION 15950 - PERFORMANCE TESTING AND FACILITY STARTUP

Bid Item No. 24

PART 1 – GENERAL

1.01 SCOPE

A. This section covers the acceptance tests of the hydraulic efficiency and mechanical operation of the pumping equipment, piping systems, chemical feed equipment complete. The Contractor shall furnish all necessary personnel and testing equipment to accurately determine the hydraulic efficiency and mechanical operation of the pumping, electrical, chemical feed, piping and all other equipment as required. Refer to SECTION 15130 – VERTICAL TURBINE PUMP COMPONENTS, SECTION 15140 – CHEMICAL TREATMENT SYSTEM, SECTION 15145 – DISINFECTION OF WELL, PUMP & PIPING, and Division 16 for additional systems testing requirements.

B. Provide a competent field service technician of the manufacturers of all equipment furnished under Divisions 11, 13, 15 and 16 to supervise installation, adjustments, calibrations, inspection, and equipment testing during three phases of testing; factory acceptance testing (FAT), operational acceptance testing (OAT), and a one-day performance test (1-Day Test).

C. Prepare work plans for factory acceptance testing (FAT) and operational acceptance testing (OAT) based on manufacturer recommendations for equipment performance.

D. Coordinate with the City/District to develop and perform the final one-day performance test (1-Day Test).

1.02 RELATED WORK

A. SECTION 01730 – OPERATION AND MAINTENANCE DATA

B. SECTION 01735 – TRAINING REQUIREMENTS

C. SECTION 15025 – PIPE (STATION, DISTRIBUTION AND DRAINAGE)

D. SECTION 15130 – VERTICAL TURBINE PUMP COMPONENTS

E. SECTION 15140 – CHEMICAL TREATMENT SYSTEM

F. SECTION 15145 – DISINFECTION OF WELL, PUMP, AND PIPING.

1.03 GENERAL

A. System Commissioning

Commission all systems and equipment to verify performance, function, and correct operation by performing procedures to activate, startup, adjust, test, and demonstrate that the work is in operating order in accordance with the general requirements of this Section and the detailed requirements of the technical sections under the system or equipment specified. Ensure that the work is ready for full-testing, documentation, inspection by equipment manufacturers and operator training, where specified.

B. Notification

Notify the Engineer five (5) days prior to starting the chemical treatment system or well pump.

C. Coordination

During the startup period, coordinate the operation of the facility with the Engineer, subcontractors, City's operators, and manufacturer's representatives. Coordinate field service technicians and subcontractors to provide power controls, chemicals, water, and ancillary systems to allow for pressurizing and starting equipment. The Contractor shall prepare a detailed checklist for all equipment noting that all prerequisite steps have been updated.

D. Testing

Furnish all test equipment including safety equipment, gauges, bulkheads, discharge and dechlorination facilities, valve and piping identification, hoses, temporary piping, caps, gauges, measuring devices and all other equipment required to conduct tests. Devices and equipment shall be fully functional, adjusted, and tested.

E. Equipment Maintenance

Maintain the equipment until acceptance. Provide all lubricants, chemicals, and electricity necessary until acceptance.

F. Expendable Supplies

The Contractor shall furnish all expendable supplies, including chemicals, gas, water, chlorine and other necessary supplies required for startup, demonstration and testing and dispose of all waste or used supplies, water, etc., in accordance with all applicable local, state, and federal regulations.

G. Facility Shut Down

The Contractor shall notify the City three (3) days prior to any shut down of the existing facility and shall coordinate with the City to insure minimal disruption of service to the community.

1.04 SUBMITTALS

A. Submit name, address and resume of proposed field services technicians at least ten (10) working days in advance of the need for such services.

B. Submit, in accordance with SECTION 01330 – PROJECT RECORDS AND SUBMITTALS,

detailed testing procedures for shop tests, FAT, and OAT, including specified test and performance requirements for various equipment, per manufacturer recommendations. The Contractor shall coordinate with the City to prepare the work plan for the 1-Day Test.

1. Submittals shall include the following:

    a. Name of equipment to be tested, including reference to Specifications section number and title.

    b. Testing schedule of proposed dates and times for testing.

    c. Summary of power, lighting, chemical, water, sludge, gas, etc, needs and identification of who will provide them.

    d. Outline specific assignment of the responsibilities of the Contractor and manufacturers' factory representatives or field service personnel.

    e. Detailed description of step-by-step testing requirements, with reference to appropriate standardized testing procedures and laboratory analyses by established technical organizations (e.g., ASTM, WPCF Standard Methods, etc).

    f. Samples of forms to be used to collect and record test data and to present tabulated test results.

2. Copies of test reports upon completion. ~~of specified shop, FAT, OAT, and 1-Day Test.~~ Test reports shall incorporate the information provided in the test procedures submittals, modified to reflect actual conduct of the tests and the following additional information:

    a. Copy of all test data sheets and results of lab analyses.

    b. Summary comparison of specified test and performance requirements vs. actual test results.

    c. Should actual test results fail to meet specified test and performance requirements, describe action to be taken prior to re-testing equipment.

3. Copies of the manufacturer's field service technician's report summarizing the results of his/her initial inspection, operation, adjustment and pre-tests. The report shall include detailed descriptions and tabulations of the points inspected, tests and adjustments made, quantitative results obtained, suggestions for precautions to be taken to ensure proper maintenance, and the equipment supplier's Certificate of Installation in the format specified herein.

1.05 QUALITY ASSURANCE AND WITNESS REQUIRMENTS

A. Field service technicians shall be competent and experienced in the proper installation, adjustment, operation, testing and startup of the equipment and systems being installed.

B. Manufacturers' sales and marketing personnel will not be accepted as field service technicians.

C. The City and/or City's representatives, as required by the various equipment Specifications, may witness shop tests or factory tests.

D. FAT, OAT, and the 1-Day Test shall be performed in the presence of the City, the City's designed personnel and/or City's representatives.

PART 2 – MATERIALS

2.01 GENERAL

A. The Contractor shall furnish all necessary personnel and testing equipment to accurately determine the hydraulic efficiency and mechanical operation of the pumping, chemical feed system, piping, and all other equipment as required.

PART 3 – EXECUTION

3.01 PRELIMINARY TESTING REQUIRMENTS

A. The following shall be completed before testing and startup begins.

1. The Engineer has reviewed and accepted the Contractor's Testing and Startup Plan.

2. Functional verification of the individual interlocks between the field-mounted control devices and the motor control circuits, control circuit of VFD controllers, packaged system controls and City SCADA System.

3. Functional verification of the individual instrumentation loops (analog, status, alarm, and control) from the field devices to the workstation display screens.

4. Adjustment of the pressure switches, flow switches, timing relays, level switches, temperature switches RTD monitors, and other control devices to the settings determined by the Engineer or the equipment manufacturer.

B. FAT, OAT, and the 1-Day Test shall be successfully executed prior to Substantial Completion and acceptance from the City of the Project.

C. The operation, testing and adjustment shall be as required to prove that the equipment has been left in proper condition for satisfactory operation under the conditions specified.

D. All performance tests and inspections shall be conducted during the work week of Monday through Friday, unless otherwise specified.

E. Successfully execute the step-by-step procedure for FAT, OAT, and 1-Day Test as indicated in the approved testing work plans.

F. Upon completion of each testing phase (FAT, OAT, and 1-Day Test), the manufacturer's field service technician shall submit a signed report of the results of his/her inspection, operation, adjustments and tests.

G. No testing or equipment operation shall take place until it has been verified by the Engineer that all specified safety equipment has been installed and is in good working order.

H. No testing or equipment operation shall take place until it has been verified by the Engineer that all lubricants, tools, maintenance equipment, spare parts and approved equipment operation and maintenance manuals have been furnished as specified.

I. In the event of failure to demonstrate satisfactory performance of the facility on the first or any subsequent attempt, all necessary alterations, adjustments, repairs and replacements shall be made. When the facility is again ready for operation, it shall be brought on line and a new test shall be started. This procedure shall be repeated as often as necessary until the facility has operated continuously to the satisfaction of the City and Engineer, for the specified duration.

J. Do not, at any time during testing, allow the facility to be operated in a manner which subject's equipment to conditions that are more severe than the maximum allowable operating conditions for which the equipment was designed.

3.02 FACTORY ACCEPTANCE TESTING (FAT)

A. Prior to delivery of the electrical control panels, the Contractor shall coordinate a Factory Acceptance Testing (FAT) of all equipment to ensure the equipment is programmed to operate as intended in the Contract Documents. Some equipment will have separate Programmable Logic Controllers (PLC), such as the onsite sodium hypochlorite generation system (OSHGS). The Contractor shall ensure that sufficient testing is scheduled with the manufactures of each system to ensure each piece of equipment operates as intended independently, and when combined in the main PLC for the entire system.

B. After installation of the equipment has been completed and the equipment is presumably ready for operation, before others operate it, the manufacturer's field service technician shall inspect, operate, test and adjust the equipment. The inspection shall include at least the following points where applicable:

   1. Soundness (without cracks or otherwise damaged parts).

2. Completeness in all details, as specified and required.

3. Correctness of setting, alignment and relative arrangement of various parts.

4. Adequacy and correctness of packing, sealing, and lubricants.

C. The operation, testing and adjustment shall be as required to prove that the equipment has been left in proper condition for satisfactory operation under the conditions specified.

D. All mechanical and electrical equipment shall be checked to ensure that it is in good working order and properly connected. During FAT, all various pumps, compressors, and other remaining equipment shall be tested through their full range of operations. Performance curves shall be established and submitted in the FAT test report. All systems shall be cleaned and purged as required. All sumps, tanks, basins, chambers, pump wells and pipelines which are hydraulically checked shall be drained and returned to their original condition once the testing is complete

3.03 OPERATIONAL ACCEPTANCE TESTING (OAT)

A. OAT shall not begin until all equipment meets the testing requirements outlined in the FAT work plan submittal.

B. The Contractor shall coordinate with the City's chemical suppliers to supply the appropriate chemicals following FAT and prior to OAT.

C. During OAT testing, all instruments and controls shall be calibrated through their full range. All other adjustments required for proper operation of all instrumentation and control equipment shall be made.

D. OAT of chemical metering and injection systems shall not include chemical addition. All chemical feed equipment shall be tested with water (not chemicals) during the OAT. Chemicals shall not be introduced to the site until the end of the OAT. Any problems found during the water test shall be corrected and retested before chemicals are introduced.

E. During OAT testing, all equipment and valve controls with the exception of the interconnection between the well system and the City's distribution system shall be tested with the control logic developed by the Owner's programmer, and prove that the equipment operates as specified. The Contractor shall make any adjustments required to the equipment and hardware furnished under their scope of work. The Contractor shall be responsible for any changes required to the PLC and SCADA programming to operate the facility.

F. During OAT, perform all other tasks needed for preparing and conditioning the treatment facilities for proper operation.

3.04 ONE-DAY PERFORMANCE TESTING (1-Day Test)

A. The 1-Day Test shall not begin until all equipment, instruments, and control logic meet the testing requirements outlined in the OAT work plan submittal and only upon City's approval. All FAT and OAT testing and instrument calibration shall be complete and all individual tests on the well pump, metering pump systems, pump control valves, and HVAC completed.

B. Prior to 1-Day Test, the Contractor shall have completed training requirements under SECTION 01735 – TRAINING REQUIREMENTS.

C. The City will furnish all operating personnel (other than vendor's or subcontractor's service personnel) needed to operate equipment during the 1-Day Test; however, said personnel will perform their duties under Contractor's direct supervision. Until performance tests are completed and units and systems are accepted by the City as substantially complete, the Contractor shall be fully responsible for the operation and maintenance of all new facilities.

D. The City will provide all necessary electricity. However, the Contractor shall provide all necessary personnel of the various construction trades, i.e., electricians, plumbers, etc, and field service personnel of the major equipment suppliers on an 8 hour per day basis at the facilities and on a 24 hour per day basis on-call during the 1-Day Test. Major equipment suppliers shall include, but not be limited to, the following:

   1. Instrumentation and Control Equipment

   2. Chemical Feed System

   3. All Pumping Equipment

E. City to furnish all chemicals, labor, power, etc., to operate plant during 1-day Performance Test. City will not provide labor for the remedying of repairs.

F. Prior to the 1-Day Test, the City shall receive spare parts, safety equipment, tools and maintenance equipment, lubricants, approved operation and maintenance data and the specified operation and maintenance instructions.

G. Prior to the 1-Day Test, the entire potable water piping system shall be disinfected in accordance to SECTION 15145 – DISINFECTION OF WELL, PUMP AND PIPING.

H. During the 1-Day Test, the interconnection with the City's water distribution system will be opened and discharges made into the City's distribution system. Only the City has authorization to operate valves that open the interconnection with City's distribution system. All necessary clearances for valve operation must be approved by the City prior to the 1-Day Test.

I. During the 1-Day Test, all equipment and valve controls shall be placed in fully automatic mode, and the well site shall be placed on-line. All equipment and valve controls including

the interconnection between the well system and the City's distribution system shall be tested with the control logic developed by the Contractor's programmer, and prove that the equipment operates as specified. The Contractor shall make any adjustments required to the equipment and hardware furnished under their scope of work. The Contractor shall be responsible for any changes required to the PLC and SCADA programming to operate the facility.

J. City to conduct 1-day Performance Test in presence of chemical treatment equipment manufacturer factory technician. Factory technician shall be required to be on-site a minimum of two separate days during this period.

K. The facility must be run 24 hours without interruption of service. If there is any major equipment or process failure during the 1-day Performance Test, once the cause of the failure is resolved by Contractor, the 1-day performance test shall be repeated until the system can be operated free from any mechanical or process failures over 24 hours.

3.05 DISCHARGE OF WATER

A. Discharged water includes but is not limited to rainwater, groundwater, water pumped or otherwise removed from excavations, whether introduced to the excavation or naturally occurring groundwater, wash water, water used for testing, flushing and chlorination, water removed from existing pipelines and water used by the Contractor for any other purpose.

B. The Contractor shall follow requirements of the Regional Water Quality Control Board, San Francisco Bay Region, Central Coast Region and the City Best Management Practices for discharge to surface waters, as applicable. The Contractor shall also follow applicable requirements of U.S. Army Corps of Engineers Section 404 Permits, California Department of Fish and Game Streambed Alteration Agreements and Regional Water Quality Control Board Water Quality certification or waiver, each as applicable.

C. The Contractor shall follow requirements of the State Water Resources Control Board, Order No. 2009-0009-DWQ National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities, as applicable.

D. The Contractor shall follow requirements of the State Water Resources Control Board, Order WQ 2014-0194-DWQ (General Order No. CAG140001) Statewide National Pollutant Discharge Elimination System (NPDES) Permit, as applicable.

E. All water discharged from or flowing from the jobsite shall be of such purity and cleanliness as not to introduce any contaminants into any watercourse, stream, lake, reservoir, or storm drain system.

   1. No liquid shall be discharged into any sewer, storm drain system or water course without appropriate permits or approval.

F. The Contractor shall be responsible for caring for the drainage on the entire work area and the disposal of such drainage from commencement of work until contract completion. Silt, eroded materials, construction debris, concrete or washings thereof, petroleum or paint products or other hazardous substances, shall not be introduced, or placed where they may be washed by rainfall or runoff, into any water course, stream, lake, reservoir, or storm drain system.

G. Water shall cause no erosion of earth, whether disturbed or not disturbed, or of excavated or dredged earth stored on site, or of material imported for fill or other purposes.

H. No soil or other material shall be discharged in a quantity that will have an adverse effect on the receiving waters. Discharge shall not cause or contribute to a violation of any water quality standard.

I. **Discharge to the Storm Drain**
The Contractor is required to adhere to the following effluent limits for discharge to the storm drain and provide discharge-monitoring submittals for each discharge event to include discharge date, flow, duration, and monitoring records:

1. Total chlorine residual less than 0.19 mg/L.

2. pH greater than 6.5 and less than 8.5.

3. Turbidity must not be greater than 5 NTU above the receiving waters if receiving water turbidity is between 1 and 50. Turbidity shall not be more than 10% higher than receiving water for NTU's greater than 50. Turbidity may not exceed 100 NTU.

The Contractor may discharge water into the existing storm drain mainline/manhole located within the pump station site once the discharge water has been sampled to show effluent limits are not exceeded. In the event any of the samples do not meet the requirements specified above, the Contractor shall stop discharge immediately and notify the Engineer.

During discharge events, samples shall be taken from the discharge stream at the farthest available location downstream of the well, prior to discharge into the storm drain mainline/manhole.

The Contractor shall prepare and submit a discharge plan to the Engineer which describes all planned activities prior to discharge to the storm drain. The Contractor shall submit copies of the plan to the Engineer a minimum of 2 weeks prior to discharges from the well/pump for review. The discharge plan shall include the following:

1. Drawings showing plan view of piping system to be used, and piping components.

2. Map showing piping discharge path to the storm drain.

3. Description of planned BMPs for prevention of erosion along the discharge path and at the discharge point.

4. Estimated discharge rate, duration, and total volume of discharge water.

5. Description of means to control discharge flow.

3.06 MAINLINE AND STATION PIPING PRESSURE TESTING

A. General

After installation, flushing and disinfection of any newly installed main lines, station piping, and appurtenances has been completed, all piping shall be hydrostatically tested, as specified herein. Hydrostatic testing shall occur after the pipe is backfilled but prior to permanent resurfacing and connection to the existing water system. Valves and other flanged fittings may be left exposed during hydrostatic testing provided sufficient thrust restraint is provided by the Contractor as necessary. The Contractor shall provide the Engineer with a minimum of five (5) working days' notice prior to the requested date and time for hydrostatic tests. All testing shall be performed in the presence of the Engineer.

Thrust blocks shall have been in place for a minimum of seven (7) days prior to testing. Pipe with mortared joints shall not be filled with water within twelve (12) hours of the time the last joint has been completed and the interior mortar placed. Do not subject the pipe to internal hydrostatic pressure until all mortared joints have cured at least thirty-six (36) hours.

Separate tests shall be made on pipelines that can be sectionalized by valves. The Contractor shall furnish all labor, materials, tools, and equipment for testing and make all necessary connections and provide all necessary bulkheads, blind flanges, spool pieces, backflow devices, piping and appurtenances, as needed.

B. Isolation

The new pipelines shall remain isolated from the existing well until after acceptance of the disinfection and hydrostatic testing. The Contractor shall provide a hydrostatic, disinfection, and bacteriological testing plan complete with locations of bulkheads, or blind flanges, or steel plates or other methods to maintain isolation from the potable water supply, to the Engineer for approval, prior to testing. All isolation equipment shall remain in-place until the new water line has passed the pressure test, passed the chlorination test, passed the bacteriological test and is approved by the City for connection.

C. Fill Rate

Fill pipeline at a rate of two (2) feet per second so as not to cause any surges or exceed the rate at which air can be released through the air valves. During filling, check all air valves to verify that they are venting correctly.

1. Mortar Lined Pipe - After pipe has been filled and all of the air purged, the pipe shall be

allowed to stand under a slight pressure for at least 48-hours prior to the hydrostatic test to allow the mortar lining, to absorb water. Additional water shall be added to replace water absorbed by the cement mortar lining.

2. Pipe with other types of lining may be tested without a waiting period.

D. Test Pressure

Pipeline and mainline valves shall be tested at a pressure of not less than 1.25 times the stated working pressure of the pipeline measured at the highest elevation along the test section and not less than 1.5 times the stated working pressure at the lowest elevation of the test section. The test pressure shall not exceed the thrust restraint design pressures or 1.5 times the pressure rating of the pipe or joint, whichever is less.

Valves shall not be operated in either direction at a differential pressure exceeding the rated valve working pressure. The test pressure shall not exceed the rated working pressure of the valves when the pressure boundary of the test section includes closed, resilient-seated gate valves or butterfly valves.

The pressure gage reading at the time of test shall be located at the highest point of the section of pipe being tested. A blind flange shall be utilized at the connection to any pump discharge heads. Test pressure shall be maintained for a period of two (2) hours. Apply and maintain the test pressure by continuous pumping if necessary for the entire test period. The pump suction shall be in a barrel or similar device or metered such that the amount of water required to maintain the test pressure may be measured accurately. The Engineer shall reserve the right to evaluate test pressure at any point along the section being tested.

E. Allowable Leakage

Leakage is defined as the quantity of water required to hold the test pressure for the duration of the test period.

1. The allowable leakage for steel (flanged or welded), ductile iron (flanged), threaded, compression fitted, and soldered pipe, shall be zero.

2. The allowable leakage for polyvinyl chloride (PVC) pipe and for steel or ductile-iron pipes with rubber joints shall be in accordance with AWWA C600 and calculated using the following formula:

$$L = \frac{S * D * (P)^{0.5}}{133{,}200}$$

L = testing allowance (gallons / hour)
S = length of pipe tested (feet)
D = nominal diameter of pipe (inches)
P = average test pressure during test (pounds / sq. inch (gage))

3. If leakage exceeds the allowable loss, the leaking areas shall be located and repaired as required by the Engineer. All defective pipe, fittings, valves, and other appurtenances discovered shall be removed and replaced with reliable material. Additional disinfection shall be performed as necessary per SECTION 15145 – DISINFECTION OF WELL, PUMP AND PIPING. The hydrostatic test shall be repeated until the leakage does not exceed the rates specified above.

F. Correction of Defects

If the leakage exceeds the allowance, the installation shall be repaired or replaced and pressure tests shall be repeated until conformance to the leakage test requirements specified herein have been met. All visible leaks from the piping, valves, flanges or gaskets shall be repaired even if the pipeline passes the allowable leakage test. All work associated with finding and fixing leaks and performing additional testing shall be performed at no additional cost to the City.

G. Contractor's Report

The Contractor shall keep records of each piping test, including:

1. Description and identification of piping tested.
2. Description of test procedure.
3. Date of test.
4. Witnessing by Contractor and Engineer.
5. Test evaluation.
6. Remarks, to include such items as;
   a. Leaks (type, location)
   b. Repairs made on leaks.

3.07 GRAVITY PIPING PRESSURE TESTING

A. After completion of any section of sewer, the grades, joints, and alignment shall be true to line and grade. Joint surfaces shall be smooth. There shall be no visual leakage and the sewer shall be completely free from any cracks and from protruding joint materials, deposits of sand, mortar, or other materials on the inside.

B. Infiltration shall not exceed 25 gallons per 24 hours per inch of diameter per mile of sewer. Contractor shall furnish all supplies, materials, labor, services, etc., needed to make infiltration or exfiltration tests including water. No separate payment will be made for equipment, supplies, material, water, or services.

C. Any leakage, including active seepage, shall be corrected by removal and replacement of pipe or joint where such leakage exists until the pipelines meet the requirements of the allowable leakage specifications.

D. The sewers installed under this contract will be subject to television inspection by the City and/or Engineer. It is the intent to televise all sewers which are suspected to contain defects

in order to insure that all installation is water tight. The City reserves the right to perform this work and will furnish all equipment and materials for such inspection. If the television work is performed by the City, the Contractor shall provide access for the City's crews and equipment for the television inspection and shall have it's representative present during inspection.

E. The television work, if performed by the City, shall be scheduled so as to take advantage of the time when the groundwater table is most likely to cause infiltration. Work shall be scheduled during or after rainy periods rather than after prolonged periods of dry weather. Logs and/or tapes of the inspections will be made available to the Contractor. Otherwise, the Contractor shall perform the work and furnish tapes and logs to the City and the Engineer.

F. All sewer pipe shall be tested using low pressure air testing in accordance with the procedures and standards listed below.

1. Clean pipe to be tested by propelling a snug-fitting inflated rubber ball through pipe with water.

2. Plug all pipe outlets with suitable test plugs. Brace each plug securely to prevent blowouts. As a safety precaution, pressurizing equipment shall include a regulator set at slightly above test pressure to avoid over pressurizing and damaging an otherwise acceptable line.

3. A plug shall be installed in one end of the pipe to be tested. A second plug with a 1/2" opening to allow for the introduction of air into the portion of pipe to be tested shall be put in place in the other end of the pipe.

4. Add air slowly to the portion of the pipe installation under test until the internal air pressure is raised to 4.0 psig greater than the average back pressure of any groundwater above the pipe (0.43 psi per foot of groundwater above the pipe invert), but not greater than 9.0 psig.

5. After an internal pressure of 4.0 psig is obtained, allow at least five minutes for air temperature to stabilize, adding only the amount of air required to maintain pressure.

6. Determine test duration for sewer section with single pipe size from the following table. Do not make allowance for laterals.

Nominal Pipe Size (inches)	**Minimum Test Time (minutes/100 feet)**
3	0.2
4	0.3
6	0.7
8	1.2

7. Allow pressure to stabilize for at least five minutes. Adjust pressure to 3.5 psig or increased test pressure as determined above when groundwater is present. Start test.

8. Record drop in pressure during test period; when air pressure has dropped more than 1.0 psig during test period, piping has failed; when 1.0 psig air pressure drop has not occurred during test period, discontinue test and piping is accepted.

9. When piping fails, determine source of air leakage, make corrections and retest; test section in incremental stages until leaks are isolated; after leaks are repaired, retest entire section between manholes.

3.08 GRAVITY PIPING DEFLECTION TESTING

A. Perform vertical ring deflection testing on PVC and ABS sewer piping after backfilling has been in place for at least 30 days but not longer than 12 months.

B. Allowable maximum deflection for installed plastic sewer pipe is limited to 5 percent of original vertical internal diameter.

C. Furnish rigid ball or mandrel with diameter not less than 95 percent of base or average inside diameter of pipe as determined by ASTM standard to which pipe is manufactured.

D. Measure pipe in compliance with ASTM D2122.

E. Perform deflection testing using properly sized rigid ball or 'Go, No-Go' mandrel.

F. Perform test without mechanical pulling devices.

G. Locate, excavate, replace, and retest pipe exceeding allowable deflection.

3.09 MANHOLES

A. All storm drain and overflow manholes shall be tested and meet the requirements of ASTM C1244, prior to acceptance by the Engineer. Test using air whenever possible prior to backfilling to assist in locating leaks. Make joint repairs on both outside and inside of joint to ensure permanent seal. Test manholes with manhole frame set in place.

B. Vacuum test in accordance with ASTM C1244 and as follows:

1. Plug pipe openings; securely brace plugs and pipe.

2. Inflate compression band to affect seal between vacuum base and structure; connect vacuum pump to outlet port with valve open; draw vacuum to 10 inches of Hg; close valve; start test.

3. Determine test duration for manhole from the following table:

Manhole Diameter (feet)	Test Time (seconds)
4	0.2
5	0.3
6	0.7

4. Record vacuum drop during test period; when vacuum drop is greater than 1 inch of Hg during test period, repair and retest manhole; when vacuum drop of 1 inch of Hg does not occur during test period, discontinue test and accept manhole.

5. When vacuum test fails to meet 1 inch Hg drop in specified time after repair, repair and retest manhole

3.10 VERTICAL TURBINE WELL PUMPING EQUIPMENT TESTING PROCEDURES

A. Acceptance tests will be conducted after installation of the vertical turbine well pumping equipment, station piping, and pipelines. The Contractor shall be responsible for field testing of all vertical turbine well pumps after installation to demonstrate satisfactory operation without causing excessive noise, cavitation, vibration, and overheating of the motor/pump bearings. Refer to SECTION - 15130 VERTICAL TURBINE PUMP COMPONENTS.

B. All testing shall be witnessed by a representative of the City. The Contractor shall notify the City five (5) days in advance of the field tests. The Contractor shall furnish all necessary personnel and testing equipment to accurately determine the hydraulic efficiency and mechanical operation of the pumping equipment as required.

C. Test equipment to be provided by the Contractor for use during pump performance testing includes, but is not limited to a flow measurement instrument (Collins tube, Pitot Tube, Cox meter, Ultrasonic meter, etc.) to verify pump flowrate, a well level sounder to verify well water level, pressure gauges to verify system pressures, and an electrical multimeter to verify input horsepower (amperage, voltage, power factor, etc.).

D. After each pumping system has satisfied the requirements, the Contractor shall certify in writing that it has been satisfactorily tested and that all final adjustments have been made. Certification shall include the date of the field tests, a listing of all persons present during the tests, and the test data results.

E. The Contractor shall bear all costs of field tests, including related services of the Manufacturer's representative, an independent vibration analysis company, and independent pump test company, except for power and water which the City will bear. If more than one 8-hour day is required for testing, due to the failure of the equipment to meet the specified performance requirements, the Contractor shall reimburse the City for the cost of any subsequent inspection for performance testing. Therefore, the Contractor is strongly urged to

perform all testing, to ensure proper equipment operation, prior to the performance testing witnessed by the City and/or the Engineer. Tests and acceptance include:

1. Measure the static voltage "leg to leg" and "leg to ground."

2. Disconnect the motor leads and using a 1,000-volt megaohm meter, "meg" each lead to check the motor. With the permission of the Engineer, the motor may be “megged” just prior to the electrician connecting and taping the motor leads. However, this is permissible only as long as this procedure is performed within 5 days of the pump performance testing and is witnessed by either a representative of the City or the Engineer. The measurements are to be within accepted motor manufacturers’ tolerances for the specific motor used.

3. Prior to performance of the acceptance tests, start the well pump and allow the well pump to pump at or within 10-percent of the design capacity. Measure the amperage per leg and the running voltage "leg to leg" and "leg to ground." Stop the pump and "roll" the leads. Start the pump and again repeat the measurements. Repeat a third time. Line balance is to be calculated and the line position with the least "unbalance" used. If the unbalance is not within the motor manufacturer’s accepted tolerances, the pump is to be shut down and the problem investigated and corrected by the Contractor at no additional cost to City, prior to further acceptance testing.

4. The Contractor shall be responsible for field-testing to check for any deviation from the rated voltage, phase, frequency, efficiency, or improper installation. Unless the measured amperage between phases is less than 5 percent, the Contractor shall “roll the leads” to balance power. If amperage cannot be balanced, the pump Manufacturer shall assess and identify the problem and implement corrective measures as appropriate.

5. The Contractor shall verify the proper stuffing box packing tension and proper operation of the pre-lubrication system, all hydraulic control valves, all manual valves, the flow meter and chemical feed equipment.

6. The Contractor shall operate the well pump and measure the capacity, discharge pressure, and pumping water level at 100% speed for a minimum of three different capacities (all three capacities shall be as selected by the Engineer which shall include the pump design point). The well pump is to be run a minimum of 10-minutes at each capacity. **For acceptance purposes, the total measured head shall be within ±15 feet of the manufacturer’s factory performance test pump curve.**

F. The Contractor shall use the field test results and calculate the overall plant efficiency (OPE). The minimum overall plant efficiency shall meet the minimum design OPE referenced in SECTION 15130 – VERTICAL TURBINE PUMP COMPONENTS.

G. A well performance and efficiency analysis report shall be prepared by an independent testing company which specializes in and performs the well pump performance testing. Six

(6) copies of a report of the results shall be provided. The report shall present a summarize all of the testing results (total dynamic head, flow, input horsepower to motor, brake horsepower, pumping water level, discharge pressure, etc.) from testing and startup activities and provide a conclusion and verification statement that the well pump performance and efficiency results meet the requirements set forth in these specifications.

H. Concurrent with the performance testing of the pump, the Contractor shall employ a company specialized in vibration testing to perform a vibration analysis, to be witnessed by the Engineer. The vibration company performing the analysis shall not be a representative or affiliated with the pump manufacturer or the Contractor. The Contractor shall furnish the necessary equipment and an operator skilled in the operation of the equipment to test the installed pump for compliance with vibration limits prescribed by the Hydraulic Institute. The test is to be done in strict accordance with the standards set forth in the latest revision of ANSI/HI 9.6.4 "Vibration Testing for Centrifugal and Vertical Pumps." Six (6) copies of a report of the results, in the Hydraulic Institute format, shall be provided. The report shall present the results of all testing and provide a conclusion and verification statement that the well pump testing and vibration results meet the requirements set forth in the latest revision of ANSI.HI 9.6.4. Any deviation from ANSI.HI 9.6.4, malfunctioning, excessive vibration, or other problems shall be corrected by the Contractor at no additional expense to the City. The Contractor shall reimburse the City for the cost of any subsequent vibration testing or inspection required to confirm compliance with these Specifications.

I. In the event of failure of any pump and or pump motor to meet any of the design requirements or efficiencies provided in the drawings, plans or the approved submittal, the Contractor shall make all necessary modifications, repairs, or replacements, and conduct field tests to conform to these specifications at no additional cost to the City. The Contractor shall reimburse the City for the cost of any subsequent inspection for performance testing.

3.11 MAINLINE VALVES, AIR/VAC VALVES TESTS

A. General

All valves shall be tested. On all valves count and record the turns required to operate from full open too full closed and record on as-built drawings.

B. Mainline Valves

Test each mainline valve by pressurizing each section between valves after completion of the pipe pressure test. Check the proper operation of valves by demonstrating smooth operation under full design hydrostatic pressure.

C. Air/Vac Valves

During filling, check all air/vac valves to verify that they are venting correctly. Operate all service valves (but not isolation valves) on air/vac valves, under design hydrostatic pressure to ensure that they open and close smoothly. Repair any defective valves.

3.12 ELECTRICAL

A. All electrical equipment shall be tested including time delays, automatic and hand operation of the pumping plant, fans, and thermostats. Refer to the applicable Electrical sections for additional testing requirements.

3.13 TRACING WIRE CONTINUITY CHECK

A. Check continuity of all tracing wire, connection and splices and repair as necessary.

3.14 TRAINING

A. See SECTION 01735 – TRAINING REQUIREMENTS for training requirements.

PART 4 – MEASUREMENT AND PAYMENT

All work as specified herein, satisfactorily completed, shall be paid for on a Lump Sum basis as stated in **Bid Item Schedule** for the item listed below:

Bid Item No. 24 – PERFORMANCE TESTING AND FACILITY STARTUP

-END OF SECTION-

SECTION 16010 - GENERAL ELECTRICAL

Bid Item No. 25, 26

PART 1 - GENERAL

1.01 SCOPE

The Contractor shall install the complete electrical systems as shown on the plans and specifications. The Contractor shall verify any existing control circuitry and modify controls, conduit, and cable as required to support modified control schemes for the project. The Contractor shall demolish all items indicated as to be removed in accordance with the Drawings and Specifications.

The Contractor shall provide all materials, tools, equipment, labor, and services necessary to furnish and install complete working electrical systems as shown on the Drawings and described within these Specifications. The Contractor shall furnish all power supplies, disconnects, controls, and any other work, as well as all electrical and electrical-related work as called for in all sections of the Specification and Drawings. All systems, at project completion and before final acceptance, shall be demonstrated to have complete and working functional operations. The work includes, but is not specifically limited to, the items indicated below.

1. Obtain permits.
2. Electrical main service if shown.
3. Furnish and install all new electrical equipment as shown on the Drawings.
4. Trenching, conduits, feeders, and cables for electric power and controls.
5. Controls, wiring, and misc. materials as shown and/or specified.
6. New instrumentation and controls as shown on the Drawings.
7. Demolition as required by the Drawings.

1.02 RELATED DOCUMENTS

Contract requirements of the foregoing General Conditions, supplements thereto and all requirements of all sections of these Specifications shall form a part of this Section with the same force and effect as though repeated herein.

A. Codes and Regulations

All electrical equipment and material and its installation shall conform to the current requirements of the following authorities:

1. Occupational Safety and Health Act (OSHA).
2. National Electric Code (NEC), (latest edition).
3. California Administrative Code (CAC), (latest edition).
   Title 8, California Electrical Code (CEC)
   Title 19, Fire and Panic Safety Standards. Title 24, Building Standard.
4. Uniform Building Code, (latest edition).
5. Uniform Mechanical Code, (latest edition).

6. Uniform Plumbing Code, (latest edition).
7. National Fire Code, (latest edition).

NOTE: Where two or more codes conflict, the most restrictive shall apply. Nothing in the Drawings and Specifications shall be construed to permit work not conforming to applicable codes.

B. Tests and Standards

The tests, standards, or recommended procedures of the following agencies shall relate to all parts of these Specifications and shall be considered a minimum:

1. American National Standards Institute (ANSI)
2. Underwriters Laboratories, Inc. (UL)
3. National Electric Manufacturers Association (NEMA)
4. Electrical Testing Laboratories (ETL)
5. National Fire Protection Association (NFPA)
6. Insulated Power Cable Engineers Association (IPCEA)
7. Institute of Electrical and Electronic Engineers (IEEE)
8. Illumination Engineering Society (IES)
9. National Electrical Testing Association, Inc. (NETA)
10. International Conference of Building Officials (ICBO)

1.03 PROJECT DESCRIPTION

Project summary. See drawings and specifications for full details.

1. New electric service to new pump building.
2. Pump power and control system. Pump control valve.
3. Well flow, level and pressure transmitters.
4. TESCO PLC and radio system per city standards
5. Building lighting and auxiliaries.
6. Extend control to chlorine chemical metering systems.

The electrical drawings are diagrammatic and do not necessarily show all raceway, wiring, number or types of fittings, offsets, bends or exact locations of items required by the electrical systems. Items not shown or indicated, which are clearly necessary for proper operation or installation of systems shown, shall be provided at no increase in contract price.

The exact routing of systems and location of devices and equipment shall be governed by coordination with other trades, structural, and architectural conditions. The local agency Inspector reserves the right, at no increase in contract price, to make reasonable changes in location of electrical equipment or wiring system so as to coordinate with other systems, to group them into orderly relationships, or to increase their utility. Contractor shall verify requirements in this regard prior to roughing-in.

Install electrical work in cooperation with other trades, make proper provisions to avoid interferences, and coordinate with structural and architectural features in a manner approved by the local agency Inspector. All changes caused by neglect to make such provisions shall be at Contractor's expense. Provide offsets and special fittings, as required to facilitate installation of the work.

When a particular product or type of product is specified with a manufacturer's designation, the latest published specifications, installation, and construction information of the manufacturer shall constitute the minimum acceptable standard. Any substitutions shall be made in accordance with subsection "Submittals."

1.04 QUALITY CONTROL

A. Workmanship

The work shall be performed by competent trained workmen, skilled in the particular phase of the work entailed. The work shall be first class throughout, neat, accurate and in full accordance with the intent of these Specifications, and to the satisfaction of the Engineer. All electrical work will be performed by a State licensed Contractor having a C-10 license.

B. Safety

All standard safety procedures as set forth by OSHA, CAC, and California Division of Industrial Safety shall be strictly adhered to.

C. Coordination

Before rough-in of any utility lines, services, and feeders, or of any equipment, the Contractor must coordinate the work with that of other crafts and trades so that these services shall be installed in their proper locations and without interference to the equipment or building structure. This will require cooperation among all crafts and trades, the Engineer, and Contractor, along with study of shop drawings and the building plans. The Contractor shall be familiar with the work of, other power utility company work so as to be able to provide electrical service of correct size, voltage, and other requirements to any equipment to be installed. The installation shall be coordinated as to location and time, and interference causing delays and non-acceptable construction shall be avoided.

Exact equipment rough-in locations shall be verified by the Contractor from the shop drawings describing the equipment being installed.

D. Cutting and Repairing

The Contractor shall do all cutting necessary for the proper installation of the work, repair any damage done by the Contractor or the Contractor's workers and coordinate the work with that of others.

E. Cleaning and Painting

All exposed work shall be thoroughly cleaned upon completion of work. Panel board enclosures, fixtures, and equipment, where finish has been marred in shipment or installation,

shall be completely refinished. Minor damage shall be rectified as indicated by the Engineer. Contractor shall remove from the site all waste and rubbish resulting from his work.

F. Permits and Fees

For work on this section, Contractor shall secure necessary permits and licenses, pay fees and deposits, and arrange for inspection, as required by applicable governmental rules, regulations, codes, utilities, and ordinances.

G. Utility Work Approval

The Contractor shall give required notice and obtain approval from the utility prior to commencing work, and shall coordinate utility inspections of work being done for the utility.

H. Supervision

The Contractor shall personally, or through a competent representative, constantly supervise the work from beginning to completion and final acceptance. The Contractor shall cooperate fully with the inspection authorities in providing information and access to the work. The Contractor, as best as possible, shall maintain the same job foreman throughout the life of the project unless a replacement is requested or authorized by the Engineer.

I. Inspection and Tests

The Contractor shall furnish all labor and test equipment required to fully test and adjust the equipment installed under the Specifications and demonstrate its proper operation.

1. Arrange for all tests and inspections and provide minimum 48 hours prior notice to the Engineer.

2. A test must demonstrate that each piece of equipment, outlet, fixture, device, and appurtenance is in sound operating condition and in proper cooperative relation to associated equipment.

3. All tests shall be conducted under supervision of the Owner or his designated representative, and any defects of any nature which are apparent as a result of such test shall be made correct to the satisfaction of the Engineer before final acceptance is made.

4. No equipment shall be tested, or operated for any other purpose, such as checking motor rotation, until it has been fully checked in accordance with the manufacturer's instructions.

5. Check and tighten nuts, bolts, lugs, and similar elements of equipment: switchboards, motor control centers, bus ways, panels, etc.

6. Submit complete test reports with the maintenance manual submission.

1.05 SUBMITTALS

Make submittals for all material to be used on the project, whether as specified or substitutions, as specified in the General Conditions.

1. All submittals shall be neat and bound in a suitable folder or binder.

2. Identify each item by manufacturer, brand, trade name, number, size, ratings, and whatever data is necessary to properly identify and check materials and equipment. Words "as specified" are not sufficient identification.

3. Identify each submittal item by reference to Specifications section in which item is specified, or Drawings and detail number.

4. Submittals shall be submitted in coherent groups, e.g., all light fixtures at one time. No partial, or incomplete submittals will be accepted.

5. Organize submittals in same sequence as they appear in Specification sections, articles, or paragraphs.

6. Submittals shall be made and approved before any material is ordered.

A. Product Data

Submit seven (7) copies, in groups, as follows:

1. Conduits and raceway types required, including fittings.
2. Electric wire, cable and connectors.
3. Electric boxes. and fittings.
4. Wiring devices.
5. Splice kits.
6. Signal system devices and equipment.
7. Instrumentation.
8. Transfer switches, services, power equipment.
9. Starters.
10. Lighting fixtures.
11. Signal system devices.

B. Shop Drawings

After receiving satisfactory product review, submit shop drawings showing physical arrangement, wiring diagrams, construction details, finishes, materials used in fabrication, provisions and conduit entrance, access requirements for installation and maintenance, physical size, electrical characteristics, foundation and support details, weight, power sources, circuit numbers, and compatibility with the Drawings and Specifications.

Show wiring as actually installed, connected, and identified for the specific project. Include identification of cables and cable conductors. Include control schematic and elementary diagrams.

Shop and instruction drawings shall cover the specific equipment or device to be installed and not merely the general class of such equipment or device.

Submit seven prints and one reproducible as follows:

1. Switchboards and Switchboard Equipment.
2. Control schematic and elementary diagrams.
3. Generation and related equipment and piping.

1.06 DOCUMENTATION

A. Construction Record Drawings

The Contractor shall furnish to the Engineer, in accordance with the General Conditions, a complete set of "as constructed" drawings which clearly indicate all deviations from the basic contract Drawings, including exact dimensioned locations and depths for all stubbed conduits, location and size of spare conduits, and conductors, all new and uncovered existing work outside the buildings, power feeder runs, and communications "primary" conduit runs. Corrections and changes shall be kept up-to-date at all times.

All submittals and shop drawings will be resubmitted, in the number required above with record drawings showing all revisions and changes made, clearly marked with field termination wire so as to reflect actual construction record conditions. Revisions and changes will be enumerated and new dates of drawings shown. Final submittal of shop drawings shall include revised control schematic & elementary diagrams. Submit with final submittals all switch board & mechanical drawings, one line diagrams, and control schematics & elementary diagrams on Computer Aided Drawing (CAD) formatted drawings containing files of all drawings in format readily acceptable to Autodesk AutoCAD.

1.07 OPERATION AND SERVICE MANUALS

Contractor shall prepare manuals describing the operations, servicing, maintenance requirements of, and complete parts lists for all electrical equipment. Submit seven (7) copies.

A. General

B. Equipment

Equipment described in the manual shall include all equipment listed under "Submittals," and all other auxiliary miscellaneous systems.

Information contained in the manual shall consist of 8 1/2-inch x 11-inch size catalog data on each item, together with parts lists, description of operation, maintenance information, shop drawings, wiring and riser diagrams, and test reports as installed. Catalogs and data in the manuals shall be neat, clean copies. Drawings shall be accordion folded to letter size and installed in an envelope within the manual. An index shall be provided, which shall list all

contents in an orderly manner with the provided, respective equipment supplier's name, address and telephone number, and the manufacturer's recommended servicing instructions. Diagrams shall be complete for each system installed. Provide divider sheets with identifying tabs between each category. The Contractor will include in the manuals a complete description and documentation of any programming done for any device or system- and include a list of all variable set points, their access address and the value as left.

A reproducible copy of the final manufacturers control drawings is required. Control plans are to be CAD compatible with ACAD- generated and the drawing file submitted as a part of the operations manual.

After completion of work a factory representative shall be present for a training course for the Owner's maintenance crews on the electrical controls and equipment. The training course shall be at least one eight-hour session.

1.08 SEISMIC RESTRAINT AND ANCHORAGE

Provide complete seismic anchorage and bracing for the lateral and vertical support of electrical equipment. For this project, it will be assumed the work is located in Seismic Zone 4.

All equipment mounted on concrete shall be secured with steel stud expansion anchors requiring a drilled hole. Powder driven anchors are not acceptable. Minimum concrete embedment shall be as required by ICSO report. Minimum spacing shall be 10 diameters center to center and 5 diameters center to edge of concrete. Maximum allowable stresses for tension and shear shall be 80 percent of the ICSO test report values (Hilti, Phillips).

1.09 EXISTING SUB-SURFACE STRUCTURES

It shall be the Contractor's responsibility to locate and protect all underground systems and structures while excavating and installing the electrical distribution system. Any damage done to the existing systems during the course of the electrical work shall be repaired to the satisfaction of the Owner and the utility or agency involved, at the expense of the Contractor. Before any digging, boring, or probing is started the Contractor will notify "U.S.A. Underground" and the "Owner" and request an underground facilities investigation.

1.10 PORTABLE OR DETACHABLE PARTS

The Contractor shall retain in his possession, and shall be responsible for, all portable and detachable parts of portions of the installation, such as fuses, keys, locks, adapters, locking clips, and inserts, until final completion of the work. These parts shall be itemized and delivered to the Owner at Final Acceptance.

1.11 GROUNDING

The conduit system supports, cabinets, switchboards, etc., and neutral conductors must be permanently and effectively grounded by means of an approved ground clamp, in accordance with the California Electrical Code of the Department of Industrial Relations of the State of California, and the National Electrical Code. All main services will have a minimum of two grounding sources

with a 25’ UFER ground being one.

The Contractor shall exercise every precaution to obtain good contacts at all panel boxes, pull boxes, etc. Where it is not possible to obtain good contacts, the conduit shall be bonded around the boxes with a No. 6, B&S gauge, rubber covered, double braided wire with ground clamps.

Equipment and raceway bonding procedures shall be rigidly maintained and meet all jurisdictional requirements of all codes and regulations. A grounding conductor shall be included in every raceway.

PART 2 - MATERIALS (Not used)

PART 3 - EXECUTION (Not used)

PART 4 – MEASUREMENT AND PAYMENT

All work as specified herein, satisfactorily completed, shall be paid for on a Lump Sum basis as stated in **Bid Item Schedule** for the item listed below:

Bid Item No. 25 – ELECTRICAL
Bid Item No. 26 – ELECTRICAL CONTROLS (MCC, CONTROLLER, & RADIO)

-END OF SECTION-

SECTION 16055 - ELECTRICAL RELATED WORK

PART 1 - GENERAL

1.01 SCOPE

Provide all related work required for installation of electrical systems. Types of electrical related work specified in this section include the following:

A. Excavating for Electrical Work:

1. Underground electrical wiring;
2. Independent (isolated) foundations;
3. Vaults and pull boxes; and

B. Concrete for Electrical Work:

1. Underground structural concrete to accommodate electrical work;
2. Vaults for electrical work;
3. Electrical equipment foundations and mounting pads;
4. Rough grouting in and around electrical work;
5. Patching concrete which has been cut to accommodate electrical work; and
6. Duct banks.

1.02 SUBMITTALS

Shop Drawings, Electrical Concrete Work
Submit shop drawings for structural type concrete work (vaults, foundations and other supports), showing dimensions of formed shapes of concrete; bending, placement, sizes, and spacing of reinforcing steel; locations of anchors, isolation units, hangers and similar devices to be integrated with concrete work; and conduit penetrations, access openings, inlets and other accessories and work to be accommodated by concrete work.

1.03 MATERIALS AND EQUIPMENT

Materials and equipment shall be new and of the best quality used for the purpose in good commercial practice.

1.04 UL APPROVAL

All material and equipment within the scope of the UL re-examination service shall be approved by the Underwriter's Laboratories for the purpose for which they are used and shall bear their label.

1.05 STORAGE

All material and equipment shall be stored in a manner to prevent damage or corrosion. Equipment with components which can be damaged by moisture shall be placed in special heated storage facilities.

1.06 DRAWINGS

Drawings for all equipment are intended to be diagrammatic only. Any location not actually dimensioned is not to be considered as necessarily final or accurate. Exact locations must be determined in the field from the requirements of the equipment that is to be installed.

1.07 COORDINATION

Before rough-in of any utility lines, services, and feeders, or of any equipment, the Contractor must coordinate the work with that of other crafts and trades so that these services shall be installed in their proper locations and without interference to the equipment or building structure. This will require cooperation among all crafts and trades, the Engineer, and Contractor, along with study of shop drawings and the building plans.

1.08 ELECTRICAL WORK EXPOSED TO WEATHER

All electrical devices and equipment installed in exposed locations shall be protected by suitable NEMA type 3R JIC enclosures, cast steel boxes with gasketed steel covers, or other Engineer approved methods.

All ferrous metal portions of electrical work exposed to weather including conduits, clamps, supports, etc., shall be hot-dip galvanized steel.

1.09 PRODUCT DATA

Submit manufacturer's data including specifications, installation instructions, and general recommendations for each item.

PART 2 - MATERIALS

2.01 CONDUIT MATERIALS AND COMPONENTS

All conduits installed outdoors, under roads, driveways, etc. are to have a minimum of 36 inches (see 3.01) cover to finish grade.

A. Threaded Metal; Rigid Steel

All locations as follows, excepting those specifically indicated for PVC Coated GRC, PVC Schedule 40 or 80. All exterior locations above grade, in concrete walls and slabs, in concrete block walls, or elsewhere as shown on the Drawings. Runs within, passing through, or above hazardous areas shall be rigid conduit exiting the duct bank or underground stub ups. Rigid steel conduit shall be new galvanized threaded, conforming to UL 6. All coupling and connectors shall be threaded.

B. Flexible Liquid Tight Metallic Conduit

Connections to machinery. Conduit shall be flexible interlocking single strip steel conduit with liquid tight exterior cover, with all connections made with plastic bushed compression fittings and with copper ground wire. Maximum length is 36 inches. American Brass Seal tight or equal, conforming to UL 1.

C. Plastic PVC, Schedule 40

Underground locations and below vapor barrier of slabs, in duct bank, and in solid grouted masonry walls where wall entry and exit points are made with rigid galvanized steel. PVC conduit shall be Type 40 thick wall polyvinyl chloride conduit, Underwriters' Laboratories tested, furnished in 10 foot lengths.

D. Plastic PVC, Schedule 80

Use in locations above grade in chemical rooms and corrosive atmosphere locations. PVC conduit shall be Type 80 heavy thick wall polyvinyl chloride conduit, Underwriters' Laboratories tested, furnished in 10 foot lengths.

E. PVC Coated Galvanized Rigid Conduit

All metallic conduits installed in contact with concrete in contact with earth, shall be coated with a minimum 40 Mil PVC coating on all conduit lengths and fittings. The coating shall correspond to ASTM D638-68, D140-64, and D746-64T specifications and Federal Test Standard 141, Method 61 5z. Coating shall be continuous without flaws showing exposed metal. Coating shall extend to the device where the conduit is terminated in exposed locations and 12 inches above grade in unexposed locations. Field applied PVC tape is not an acceptable substitute for PVC coated rigid conduit.

Conduits which start up through floor shall be installed so that none of the curved portion of the elbow is exposed.

2.02 WIRING DEVICES

Receptacles:

A. Standard Duplex Receptacles

Full gang size, polarized duplex, parallel blade, U-grounding slot, specification grade, rated at 20 amperes, 1 25 volts, designed for split feed service. Hubbell, GE, or Bryant 5362 with S.S. Plates.

All switches are to be mounted at plus 48 inches to center line of handle from finish grade or floor.

B. Duplex Receptacle - Ground Fault Interrupting

Hubbell, GE, or Bryant No. GF-5362 with S.S. Plates. All receptacles are to be mounted no lower than 15" from finished grade or floor to center of receptacle.

C. Nameplates

Provide engraved cover plates for receptacles and/or switches other than standard duplex receptacles or switches, indicating voltage, phase and amperes, or function of switch or plug.

D. Color

Normal Power Circuits: Provide ivory receptacles in areas with light wall finish, and brown receptacles in areas with wood or dark wall finish. Receptacles on Emergency Power Circuits are to be red.

2.03 WIRE

Low Voltage - (Under 600 Volts):

A. Wire Type and Sizes

Conductors shall be flexible stranded tinned copper, UL listed Type THHN/THWN-2 and shall be rated 600V. Wires for instrument signal circuits shall be No. 16 AWG minimum. Control and alarm input circuits shall be #14 AWG. Wires supplying 120 VAC power on the line side of a fused disconnect shall be #12 AWG (minimum). All 20/1 home runs over 180 feet from panel for 277 volt circuits, and 100 feet from panel for 120 volt circuits shall be increased to next larger size.

Twisted single pair aluminum polyester shielded signal cable shall be Belden No. 8760, #18 AWG tinned copper, 300V polyethylene insulated, copper drain wire or equal.

Twisted single triad aluminum polyester shielded signal cable shall be Belden No. 8770, #18 AWG tinned copper, 300V polyethylene insulated, copper drain wire or equal.

Modbus plus RS-485 Twisted single pair aluminum polyester shielded signal cable shall be Belden No. 9841, #24 AWG tinned copper, 300V polyethylene insulated, overall copper braid sheath or equal.

B. Wire Insulation Colors

Conductors shall be identified by color-coded insulation. The color of the insulation of the conductors shall be as follows, except as indicated otherwise in the Contract Documents.

120/240 VAC Power	120 VAC Control
Hot - Black	PLC Output - Red
Neutral - White	PLC Input - Orange
Ground - Green	All Other Control - Violet
	Foreign Voltage Source - Yellow

24 VDC Power	24 VDC Control
Positive (+) - Dark Blue	PLC Output - Pink
Negative (-) - Dark Blue w/White	PLC Input - Light Blue
	All Other Control - Light Blue/White

Analog Signal

0-5 VDC - Brown w/White
4-20 mA - Positive (+) - Red
Negative (-) - Black
Pulse - Black w/White

C. Conductor Identification

Wire marking shall be as follows: Each signal, control, alarm, and indicating circuit conductor connected to a given electrical point shall be designated by a single unique wire number which shall be shown on all shop drawings. These numbers shall be marked on all conductors at every termination.

The letters and numbers that identify each wire shall be machine printed on sleeves with permanent black ink. The figures shall be 1/8-inch high. Sleeves shall be yellow or white tubing and sized to fit the conductor insulation. Hot air shall be used to shrink the sleeves to fit the conductor after installation. The sleeves shall be TMS Thermofit Marker System by Raychem Co., sleeve style wire marking system by W. H. Brady Co. or equal. Adhesive strips are not acceptable.

2.04 LIGHT FIXTURE SCHEDULE

(A)-4’ LED strip- Dust and moisture tight, rapid start, any temperature
4’ Lithonia FEM4LED
4’ Holophane EMLS4LED 4L IMAFL

(B)-LED Wall Pack Indoor/Outdoor W/PE, motion detector & override switch
Holophane IV W4GLED-10C-1000-40K-T3M-MVOLT-PE-BZ
LED 10C 1000 40K T3M MVOLT

(C)-Exit and Emergency
Lithonia LHQMSW1R120-277
Holophane QM LED R

(D)-Motion Sensor Passive Infrared Outdoor
Hubbell PSWM-140-B

2.05 CONCRETE WORK

A. Equipment Bases
2,500 psi concrete in 28 days and reinforcing in accordance with Section 03300.

B. Pole Fixture Bases
3,000 psi concrete in 28 days and reinforcing in accordance with Section 03030.

PART 3 EXECUTION

3.01 EXCAVATING FOR ELECTRICAL WORK

A. General
Do not excavate for electrical work until work is ready to proceed without delay, so that total elapsed time from excavation to completion of backfilling will be minimal.

Excavate with vertical-sided excavations to greatest extent possible, except where otherwise indicated. Where necessary, provide sheeting and cross-bracing to sustain sides of excavations. Remove sheeting and cross-bracing during backfilling wherever such removal would not endanger the work or other property. Where not removed, cut sheeting off at sufficient distance below finished grade to not interfere with other work.

B. Width and Cover
Unless otherwise noted, minimum earth cover above conduit shall be 36-inches. Excavate for conduit with 6-inch to 9-inch clearance at both sides of conduit, except where otherwise shown or required for proper installation of joints and fittings. Excavate for other electrical work to provide minimum practical but adequate working clearances.

Excavate near large trees (within drip line) by hand, and protect the root system from damage or dry out to greatest extent possible. Verify trench locations with Engineer prior to trenching. Maintain moist conditions for root system and cover exposed roots with burlap.

Store excavated material (temporarily) near excavation, in manner which will not interfere with or damage excavation or other work. Do not store under trees (within drip line).

1. Retain excavated material which complies with requirements for backfill material.

2. Dispose of excavated material which is either in excess of quantity needed for backfilling or does not comply with requirements for backfill material. Remove unused material from project site, and dispose of in a lawful manner.

3.02 DEWATERING

Maintain dry excavations for electrical work by removing water. Protect excavations from inflow of surface water. Pump minor inflow of ground water from excavations.

3.03 BACKFILLING

Coordinate backfill with piping contractor to prevent pipe damage. Except as otherwise indicated, backfill with Class 2 aggregate base compacted to a 95 percent relative density free from boulders, trash, and rubble. Pavement replacement shall be as shown on the Drawings.

Condition backfill material by either drying or adding water uniformly, to whatever extent may be necessary to facilitate compaction to required densities. Do not backfill with frozen soil materials. No jetting will be permitted.

Backfill simultaneously on opposite sides of electrical work, and compact simultaneously.

Backfill excavations in 6-inch high courses of backfill material, uniformly compacted to the following densities (percent of maximum density, ASTM D 1 557), using power-driven hand operated compaction equipment. Minimum acceptable compaction shall be 95 percent.

Backfill to elevations matching adjacent grades.

Install marker 'WARNING' tape 12 inches below finish grade for all conduit installations, or as per detail.

Compaction Test: Demonstrate proper compaction by testing at one-half of the trench depth. Perform three tests per 100 feet of trench (Contractor pays fees).

3.04 BORING AND CUTTING

Where trench crosses concrete walks or paved areas, bore or saw cut and patch as required for conduit installation. Boring shall be by screw auger or dry ramming. Where soil conditions warrant, (water boring may be allowed on a case by case basis upon approval of the Engineer). No water jetting shall be allowed.

Bore and saw cut as indicated on the Drawings, or where not indicated; bore under walls, paved or concrete surfaces 30'-0" wide or less, saw cut walls, paved or concrete surfaces wider than 30'-0".

3.05 INSTALLATION OF CONDUIT RACEWAYS

A. General

Install conduits in a neat manner, concealed except as noted. Mount conduits directly to building structure with clamps or one hole straps where possible. Secure straps with cadmium-plated wood screws into wood, machine screws into metal or inserts preset in concrete. Where impractical to secure directly to structure, suspend on conduit hangers. Wherever possible, group and rack multiple conduit runs.

B. Installation and Cleaning

Install free from dents, kinks and bruises. Plug ends at time of installation to prevent entry of dirt or moisture. Thoroughly clean out conduits before installing conductors. Thoroughly clean all exposed conduit exteriors.

Provide tagged pull wire in all empty conduits. Pull wire shall be 3/16-inch stranded nylon with a minimum breaking strength of 800 pounds. Leave 36 inches free coiled each end and tag as to where other end is.

Plastic conduit shall be installed in accordance with manufacturer's recommendations and accepted trade practice. Where plastic conduit runs rise above ground in exposed locations, and for all conduit runs larger than 1-inch diameter, the riser bend and riser shall be of galvanized rigid metal conduit installed according to rigid metal portion and requirements of electrical specification sections.

All plastic, flexible, feeder and receptacle branch conduits shall carry a grounding bond wire with the size as shown, or where not shown, as determined by applicable codes for the capacity of the circuit being carried.

C. Protective Coating

All metallic conduits installed in contact with earth, or in concrete in contact with earth, shall be coated with a minimum 40 Mil PVC coating on all conduit lengths and fittings. The coating shall correspond to ASTM D638-68, D140-64, and D746-64T specifications and Federal Test Standard 141, Method 61 5z. Coating shall be continuous without flaws showing exposed metal. Coating shall extend to the device where the conduit is terminated in exposed locations and 12 inches above grade in unexposed locations. Field applied PVC tape is not an acceptable substitute for PVC coated rigid conduit.

Conduits which start up through floor shall be installed so that none of the curved portion of the elbow is exposed.

D. Concrete Encased Conduits

All conduits for circuits over 600 Volts indicated on the Drawings shall be concrete encased to a minimum of 3 inches beyond the outside wall of the conduit, all around. Use 2,000 psi red concrete.

E. Conduits Penetrating Floors and Walls

Provide grouting around raceways where penetrating floor slabs, concrete or masonry walls. At fire separation walls or floors use Engineer approved expanding type foam, 3M or equal, to maintain the fire rating of the surface penetrated. Seal all conduit entrances into switch gear of motor starter. All conduits are to be installed inside walls and under floor where possible. Only overhead lighting conduits are to be installed in ceilings and will exit walls in attic.

3.06 INSTALLATION OF EXTERIOR PULL BOXES

Where pull boxes are used without bottoms, they shall be set on 3/4-inch crushed rock of a volume equal to that of the pull box used. Bottoms and joints will be grouted over for paper layer, made water tight, and sloped toward middle with a /12 inch drain hole.

Where pre-cast units are used, all joints are to be tongue and groove, sealed with a suitable sealer. Where conduits enter horizontally, they shall be bushed with belled ends and terminated flush with the inside of window. All cracks and openings shall be grouted smooth.

Where conduits enter, other than from horizontal runs, they shall be properly bushed and extended a minimum ½-inch from inside of wall or bottom into pull box. They shall be at no more than a 45 degree rise from the horizontal runs.

All conduits entering pull boxes and manholes shall be sealed watertight with suitable duct sealing compound.

3.07 INSTALLATION OF WIRE

A. Scope

Provide all wiring for complete electrical work, installed in code conforming raceway.

Color coding shall be strictly adhered to and shall be as follows:

1. Color coding for 277/480-volt system shall be:

A Phase - Brown	B Phase - Orange	C Phase - Yellow
Neutral - Gray	Ground - Green	Travelers - Lavender

2. Color coding utilized shall be noted on electrical "as constructed" drawings and shop drawings.

3. Wires shall be of solid colors in size No. 6 and smaller. In sizes No. 4 and larger, the wires shall be black and a 3-inch width of the appropriate color tape shall be applied around the wire at 12-inch intervals starting 2-inches from the termination of the end of the wire.

4. The color coding for control circuit wires will be as noted on the Drawings or as agreed upon with the Engineer and will be of a color other than that designated for the phase wires. Where control wires are installed and various colors are used, they shall be noted on the "as constructed" drawings and shop drawings turned in at the completion of the job.

5. Where modifying or renovating existing systems, color coding shall match existing. Where existing color coding is different than that indicated in No. 1 and No. 2 above, Contractor shall notify the Engineer prior to ordering wire so that a logical system can be agreed upon.

B. Pulling

Use approved wire pulling lubricant for pulling No. 4 AWG and larger wire. Oil or grease is prohibited as a conductor pulling lubricant. All conductors No. 8 and smaller shall only be pulled by hand. Pulling lubricant for conductors over 600 V shall be approved by the conductor manufacturer and the Engineer.

C. Splices

Join the conductors securely, both mechanically and electrically using crimp connectors, except that screw-on spring-type compression connectors may be used for No. 10 AWG wires or smaller. The splice area shall be taped to provide equal or greater insulation than the original. Tape run-back over the original insulation shall extend 3 to 5 overall diameters of the insulated wire. All wet location and below grade splices shall utilize 3M Scotchcast resin splicing kits or equal.

Splice only in accessible junction or outlet boxes.

Wiring in panel boards, switchboards, and cabinets shall be neatly installed. Wiring shall be grouped, laced or clipped, and fanned out to wiring terminals.

D. Identification and Markings

In addition to all other requirements for identification and marking of wires, panelboards, and junction boxes the following shall be strictly adhered to:

1. The identification of individual wires terminating in either junction boxes, circuit breakers, terminal strips, or on control devices shall be done by means of waterproof ink on a linen tag or approved equal.

2. Each end of particular feeder or sub distribution class circuits shall be marked as to its phase and point of origination of destination and either voltage line to line in distribution class circuits or voltage to ground in sub distribution class circuit.

3. Where distribution wires are terminated in distribution panels, they shall be marked by a minimum 1-1/2 inch square tag, or approved equal, as to either the point of supply or the point of destination, phase and line voltage.

4. Where sub-distribution wires terminate they shall be marked with the point of origination or point of destination, phase, and voltage to ground. This will include all sub-distribution circuits originating from 480/277 volt or 208/120 volt distribution panel serving lighting circuits, receptacle circuits, smaller power equipment, and small mechanical equipment.

5. All control circuits will be marked at each control panel as to their function and where they terminate. Where control wires terminate into relays, enclosures or terminal cans remote from the main point of control, the wires will be marked as to their function and where they originate.

6. All associated wiring integral within a control cabinet may be marked with the printed circular wire wrapping at each end.

E. Testing

1. All wires under 600 volt potential shall be tested with a 600 volt megohm prior to energization and the readings shall be recorded and handed in with the record drawings at the completion of the project. The tests shall be conducted from phase to phase and from each phase to ground.

3.08 INSTALLATION OF CONCRETE WORK

Install concrete for electrical work in accordance with the Drawings

3.09 PERFORMANCE AND MAINTENANCE, EXCAVATION WORK

Where subsidence is measurable or observable at electrical work excavations during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality and condition of the surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

PART 4 – MEASUREMENT AND PAYMENT

No separate payment will be made for Electrical Related Work. Payment for work in this section shall be included as part of the applicable Lump Sum or Unit Prices stated in other sections.

-END OF SECTION-

SECTION 16305 - SERVICE, DISTRIBUTION, AND GROUNDING

PART 1 - GENERAL

1.01 SCOPE
Furnish and install a complete electrical service, distribution, and grounding system. Conditions of this section apply to all Electrical sections included.

1.02 QUALITY ASSURANCE
Codes and Regulations, Reference Standards: See section 16010 1.02.

1.03 SUBMITTALS
A. Product Data
Submit manufacturer's date on service entrance equipment, switchboards, motor control centers and/or individual starters, transformers, panel boards, disconnect switches and grounding components.

1. Data submitted shall describe all circuit breakers by frame type and published AIC system rating.

B. Trip Curves
Submit trip curves for all circuit interrupting devices.

C. Nameplate Schedule
Submit nameplate schedule for approval.

1.04 COMPONENT COORDINATION
In order to maintain close control and coordinate the various components of the distribution systems, the number of manufacturers shall be kept to a minimum.

Equipment manufacturer shall be Eaton, or Square D. It shall be the manufacturer's responsibility through the Contractor to coordinate all components of the system in order to ensure systems that will provide maximum protection of equipment and reliable safe operation.

PART 2 - MATERIALS

2.01 GROUNDING
Electrical grounding and bonding systems shall be installed as indicated herein and/or on the other Contract Documents with materials including, but not limited to, cables/wires, connectors, solder-less lug terminals, grounding electrodes and plate electrodes, bonding jumper braid, exothermic connections, and additional accessories needed for a complete installation. Where materials or components are not indicated, provide products which comply with NEC, UL, and IEEE requirements and with established industry standards.

System ground conductors shall run continuously in duct banks and cable trays, through manholes, hand holes, and other raceway boxes. The system ground conductor shall be connected to the structure grounding systems to provide a continuous ground system.

The grounding electrode system shall consist of concrete encased, bare minimum #2/0 AWG copper ground conductors and/or ground rods. Also, refer to plans and conform to size shown. Any ____ minimum service and equipment ground conductors will be per CEC-ART. 250 where not shown on Plans or described in Specifications.

Each raceway, panel, switchboard, and other metallic device associated with the electrical and instrumentation systems shall be bonded to this system. All equipment cases, devices, etc. shall be grounded. Metallic raceways terminated in power distribution equipment, MCCs's, junction and/or control boxes will have plastic bushed grounding bushing.

Ground rods shall be driven or concrete-encased bare copper conductors installed before a building or structure is built, and ground conductors shall be brought through the concrete to accessible points for grounding equipment. Each structure or building where switchgear, MCCs, switchboards, panel boards, etc. are installed shall have a ground system.

Driven ground rods shall be steel with copper welded exterior (Copperweld), 3/4-inch diameter by 10 feet in length.

All connections of ground cable to rods or to cable shall be by means of exothermic welded connections, or approved equal.

The Contractor shall ground the electrical service system neutral at the service entrance equipment to the grounding electrode system and ground each separately derived system neutral to the nearest effectively grounded structural steel member or the grounding electrode system. Do not ground system neutral down stream from a main service or transformation point.

The Contractor shall connect together service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and plumbing systems as required by Section 250-80 of the National Electrical Code and/or California Electrical Code (CEC).

Unless otherwise indicated on the Contract Documents, the Contractor shall provide electrical grounding conductors for grounding system connections that match power supply wiring materials and are sized according to NEC/CEC. All equipment grounding conductors shall consist of a separate insulated equipment grounding conductor run in the conduit or multi-conductor cable from the equipment to the MCCS, panel board, switchgear, etc. equipment ground bus. A separate equipment grounding conductor, in addition to the cable shields, shall be provided in each raceway containing medium voltage power cables.

The Contractor shall terminate feeder and branch circuit insulated equipment grounding conductors with grounding lug or bushing.

The Contractor shall tighten grounding and bonding connectors and terminals, including screws and bolts, to the manufacturer's recommended torque values. Where manufacturer's torque values do not exist, comply with torque values specified in UL 486A.

2.02 MOLDED CASE CIRCUIT BREAKERS

A. General

Provide factory-assembled, molded case circuit breakers of frame sizes, characteristics, and ratings indicated. Circuit breakers shall be UL listed and meet NEMA Standards Publication AB1. Breakers covered under this specification may be applied in switchboards, panel boards, motor control centers, combination motor starters, and individual enclosures. Circuit breakers shall be manufactured by Eaton, or Square D.

B. Construction

Construct with over center, trip-free, toggle-type operating mechanisms with quick-make, quick-break action and positive handle trip indication. Construct breakers for reverse connection capability, mounting and operating in any physical position, and operating in an ambient temperature of 40 degrees C. Two and three-pole breakers shall be common trip. Provide breakers with mechanical screw type removable connector lugs, AL/CU rated.

C. Operation

Automatic operation of the circuit breaker shall be obtained by means of thermal and magnetic tripping devices located in each pole of the breaker. The thermal device shall provide time-delay tripping on overloads, and the magnetic device shall provide instantaneous tripping on short circuits. The instantaneous magnetic trip shall be adjustable and accessible from the front of the breaker on frame sizes above 125 amperes.

D. Current Limiting Breakers

Provide breakers with current limiting capability as indicated or required to meet system short circuit requirements. Square D, I-Limited, Eaton, or equal.

1. On high level fault currents, the circuit breaker shall limit peak current and let-through energy and provide a voltage transient-free interruption at near unity power factor. On fault currents below the threshold of limitation, the circuit breaker shall provide conventional overload and short circuit protection.

2. The unit shall not contain replaceable elements and the limiter shall automatically reset after circuit interruption.

E. Series Connected Ratings

Where utilized to meet short circuit requirements, combinations for series interrupting ratings shall be recognized by Underwriters Laboratories and shall appear in the Recognized

Component Directory under the "Circuit Breakers - Series Connected" product category DSKY2. Current limiting circuit breakers shall allow the use of branch circuit breakers with lower interrupting capacities on systems capable of delivering fault currents up to 200,000 rms symmetrical amperes at 480VAC and 100,000 rms symmetrical amperes at 600VAC. Series connected rating shall be indicated on electrical equipment per N.E.C. Articles 110-22 and 240-83 (c).

F. Solid State Trip Breakers

Main and feeder breakers indicated "SS" shall be solid state trip type with ampere setting adjustment knobs for changing current carrying capability of units, and with ground-fault protection components with external neutral current transformer (CT).

Construct with current carrying components isolated from the trip unit and field installed accessories, and with integral trip unit independent of any external power source. Square D, ME/NE/PE/SE, General Electric, Eaton, or equal.

1. Provide with Long Time, Short Time, Instantaneous, and Ground Fault pickup and delay (LS16), unless indicated otherwise.

G. Ground Fault Protection

All 1,000 amp or greater, 480 volt and "GFI" indicated service breakers shall be furnished with ground fault protection. Protection may be provided by a zero sequence/shunt trip system or solid state breaker with integral GFI. System shall be complete with all required CTs, power supplies, etc., required. Trip units shall be LSIG. Unit will be approved by U.L. for intended purposes. Test and submit results to Engineer per NEC/CEC.

2.03 PANELBOARDS

Panelboards shall be Air Circuit Breaker bolted type, UL rated for 75 degree C connections, with voltage, phase, breakers, and NEMA rating as specified in panel board schedules. Panelboards shall be installed flush or surface as indicated. Panelboards shall be installed in code gauge rustproof steel cabinets with flush doors having flush locks all keyed alike and with trim cut square and true.

A. 120/240-208 Volt Panelboards

Square D type NQOB, Eaton, or equal.

2.04 SWITCHBOARDS

A. General

Except as otherwise indicated, provide switchboards of types, sizes, characteristics, and ratings indicated, which comply with manufacturer's standard design, materials, components, and construction in accordance with published product information. All main services and attached switch boards are to meet the level of incoming short circuit current as delivered by the serving utility.

B. Manufacturer

Subject to compliance with requirements, provide switchboards manufactured by Eaton, or Square D Company.

C. Auxiliary Components

Where indicated, or specified, auxiliary components such as transformers, meters, contactors, controllers, etc., shall be incorporated at the factory. Miscellaneous components such as current transformers, instrument transformers, etc., shall be included as required to form complete and functional systems, whether specifically specified or not.

D. AC Dead-front Distribution Switchboards

Provide factory assembled, dead-front, metal enclosed, self-supporting secondary power switchboards, consisting of panel (vertical) units, and containing circuit breakers of quantities, ratings and types indicated. Provide copper main bus and connections to switching devices of sufficient capacity to limit rated continuous operating temperature rise to 54 degrees F, and 90 degrees F for circuit breaker branches; with main bus and tap connections silver-surfaced and tightly bolted for maximum conductivity. Brace bus for short circuit stresses up to maximum interrupting capacity. Prime and paint switchboard with manufacturer's finish and color. Use tin plated copper buss bars.

E. Enclosures

Construct dead-front switchboards, suitable for floor mounting, with front cable/wire and conduit accessibility. Provide welded steel channel framework, hinge wireway front covers to permit ready access to branch circuit breaker load side terminals. Coat enclosures with manufacturer's standard corrosive resistant finish. NEMA Type 3R construction, unless otherwise noted.

F. Short Circuit Rating

Switchboards shall have integrated short circuit rating meeting the serving Utility Company available,. Delivery and as a minimum, 480/277V (400A and below) 42,000AIC, 240/120V (400A and below) 65,000 AIC, 480/277V (401-1,000A) 65,000 AIC, and 480/277V (above 1,001 amps) 100,000AIC.

G. Service Switchboards

Switchboards to be utilized as service boards shall be construct in accordance with the serving Utility Company requirements; pull section, lugs, meter provisions, etc.

1. Provide with specific grounding provisions as indicated on Drawings.

2. Provide any and all requirements, equipment, and wiring or bussing as required by servicing utility.

2.05 NAMEPLATES

Laminated engraved phenolic plastic, color coded blue for 277/480-volt equipment, black for 120/208-volt equipment and red for emergency functions and equipment, with white letters. Provide

for identification of each piece of equipment, switchboards, transformers, panel boards, disconnects and enclosed breakers, and motor control centers. Secure to face with two (2) stainless steel screws each. A schedule of nameplates shall be included with the shop drawings for approval. Nameplates shall be secured with permanent adhesive and two (2) chrome plated self tapping screws.

Each piece of equipment junction, central panels and or fleet equipment enclosures shall be provided with a 2-inch x 3-1/2-inch nameplate on the front of the door or on the trim, indicating designation and distribution panel and circuit feeding the panel.

Switchboards, distribution panel boards, and all starters and disconnects shall have sub feeders and main breakers marked with 1-inch x 3-inch nameplates indicating load served, amp frame, amp trip, starter size, starter breaker sizing, maximum horsepower, voltage, amperage, and phase.

2.06 FEEDER CONNECTIONS

Provide cast saddle type bolted lugs, or hydraulically set compression lugs, for all bus connections. Manufacturer shall be Thomas and Betts, Burndy, O.Z. or approved equal. Lugs in which the set screw embeds directly into feeder conductor shall not be used. All splices will be compression butt spliced with heat-shrink insulation.

2.07 MISCELLANEOUS

A. Equipment Bases

Provide appropriately sized concrete housekeeping bases for all floor-mounted equipment.

B. Hoisting Lifting Lugs

Provide on all heavy equipment as required to ensure safe hoisting.

C. Space for Future Protective Device

Provide as indicated on the Drawings; shall be completely equipped for the future addition of a circuit breaker or fused switch, including all connections.

D. Keys

All equipment enclosures shall be keyed alike.

PART 3 - EXECUTION

3.01 INSTALLATION OF GROUNDING

A. Scope

Provide grounding system complying with the codes and ordinances specified. Grounding system shall provide continuity through the entire electrical system including:

1. Panel board ground buses.

2. All conduit, other raceways, and ground bushings.

3. All motors.

4. All lighting fixtures.

5. Grounding terminals of all receptacles.

6. Miscellaneous grounds required by code.

Equipment and raceway bonding procedures shall be rigidly maintained and meet all jurisdictional requirements of codes and regulations.

Good, electrically continuous, metal to metal contacts shall be made wherever possible at all panel boxes, etc. Where it is not possible to obtain good contacts, the conduit shall be bonded around the boxes with a No. 6 B&S gauge, rubber covered, double braided wire with ground clamps.

A separate grounding conductor shall be run in all conduit runs from distribution, lighting, and power, etc., panel boards, motor control outlet, etc., back to their respective service or distribution panel boards.

B. Flexible Conduit Grounding

Provide a separate grounding conductor in all conduit runs to include watertight flexible conduit with integral grounding straps. Install ground conductors inside conduit with ungrounded conductors. Extend from nearest panel to device being connected.

3.02 INSTALLATION OF SWITCHBOARDS

Install switchboards as indicated, in accordance with manufacturer's written instruction, and with recognized industry practices to ensure that the switchboards comply with requirements of NEMA and NEC standards, and applicable portions of NECA's "Standard of Installation."

Prior to energization of circuitry, check all accessible connections to manufacturer's torque specifications. Subsequent to wire and cable hook-ups, energize switchboards and demonstrate functioning in accordance with requirements.

A. Testing

All GFI breakers shall be tested and shown to comply with NEC Section 230-95 in accordance with International Electrical Testing Association, Inc. (NETA) standards by a NETA certified independent testing company. Submit results to Electrical Engineer and Owner.

Panel boards shall have a plastic-covered circuit directory card on the inside of each door with all circuit destinations neatly typed. Provide also project name and date of installation.

PART 4 – MEASUREMENT AND PAYMENT

No separate payment will be made for Service, Distribution and Grounding. Payment for work in this section shall be included as part of the applicable Lump Sum or Unit Prices stated in other sections.

-END OF SECTION-

SECTION 16400 - MOTOR CONTROL CENTERS AND CONTROLS

PART 1 - GENERAL

1.01 SCOPE
Furnish and install the motor control center consisting of a rigid, free standing assembly as indicated on the Drawings and as specified.

1.02 QUALITY ASSURANCE
Codes and Standards
Comply with requirements set forth by Underwriters Laboratories publication, UL-845, NEMA publication No. ICS-2, the National Electric Code, and other applicable codes.

1.03 SUBMITTALS
A. General
Voltage, phase, frequency, horizontal and vertical bus capacity, short-circuit ratings branch circuit-breaker ratings, types of motor starting types of wiring, panel boards, and transformers.

B. Shop Drawings
Submit layout drawings of motor control centers (MCC) showing accurately sealed basic equipment sections including, but not limited to, motor starters, controllers, device panels, and circuit breakers. Show spatial relationships of MCC components to proximate electrical equipment. Clearly differentiate on wiring diagrams those conductors which are factory-installed and those which are field-installed. Show all areas for conduit and wire entrances.

C. Maintenance Data
Submit maintenance data and parts list for all electrical equipment supplied, including "trouble-shooting" maintenance guide.

1.04 MANUFACTURER
Subject to compliance with requirements, provide motor control centers of one of the following: Square D, Allen Bradley, Eaton, or an approved equal.

PART 2 - MATERIALS

2.01 MOTOR CONTROL CENTERS AND COMPONENTS
A. General
Provide motor control centers and ancillary components of sizes, ratings, classes, types, and characteristics indicated; which comply with manufacturer's standard design, materials, components, and construction in accordance with published product information, as required for complete installation, and as specified herein.

B. Motor Control Centers

Provide motor control centers for operation on 480 VAC, 3-phase, 4-wire, or as shown the Drawings, 60 Hz grounded service, or otherwise indicated on the Drawings, consisting of one or more vertical sections, each with components and spaces as indicated on the Drawings. Design MCC for connection to available faults of not less than that of main service panel. Provide MCC with NEMA Class 2, Type B wiring.

C. Structures

Provide factory-assembled, deadfront, with enclosed vertical sections, as indicated on the Drawings, fastened together to form rigid free-standing assembly. Unit shall be able to house the horizontal and vertical busses, motor starters, panelboards, circuit breakers, control and distribution transformers and other components and shall be designed to allow for easy rearrangement of components by the purchaser. Construct units NEMA type 3R enclosure for exterior service and NEMA 1G for indoor applications. All units to be UL labeled.

D. Bus System

Construct bus bars of tin-plated copper, braced to withstand fault equal to main service panel; provide main horizontal bus with rating of per drawings, and vertical bus rating of 300 amperes; and construct vertical bus bars with protective barriers to prevent accidental contact of personnel with bus. Provide tin-plated copper ground bus running full width of MCC at bottom of lineup.

E. Starter Units

Starter units based on DIN or IEC standards are not acceptable. Starter units utilizing electronic circuitry to reduce the physical area of the main contacts are not acceptable. Provide magnetic motor starters with circuit breaker type disconnects and auxiliary control devices as indicated on the Drawings. Motors 50 HP and over or per drawings will be provided with reduced voltage starting. Enclose and isolate each unit from adjacent units. Design units so that faults will be contained within compartments; and with stated rms symmetrical fault withstanding ability. Equip with thermal and magnetic overload protection device for each motor, indicating circuit breaker position switch, selector switch, two (2) auxiliary contacts (interchangeable NO to NC), and an individual control transformer. Also refer to the Drawings for added control devices to be included.

F. Power Metering

Motor control centers shall include metering for voltage and amperage. Manufacturer to beElectroIndustries Shark 200, Square D Powerlogic, or equal Multifunction meter with Ethernet and 4-20 ma options.

G. Control Transformers

A 480-120 V control transformer shall be supplied for each magnetic motor starter and lighting and heating controller, and shall be one standard size larger than is required for the motor space heater, control devices, and/or indicating lights shown on the Drawings.

Each control transformer shall have both primary legs fused, one secondary leg fused, and the other secondary leg grounded. Connections to both secondary legs shall be provided at the control terminal strip.

H. Disconnect Operators

Provide external operator handles for switches and circuit breakers. Design handle with up-down motion and with down position indicating OFF. Construct handles which permit locking hand in ON and OFF position with three padlocks.

I. Identification Operators

Provide equipment/system identification nameplates for each section complying with Section NAMEPLATES, and in accordance with Motor Control Schedule on the Drawings.

J. Finishes

All exterior and interior surfaces shall be properly cleaned, and primed with a rust inhibiting prime coat. Provide two (2) finish coats of manufacturer's standard color baked-on enamel finish.

2.02 Control Stations and controls

A. Control Stations

Push buttons, selector switches, and pilot lights shall be heavy duty, oiltight/watertight devices installed in NEMA 4X enclosures, MCCs, and control panels. Lamp devices shall use LED style lights. These devices shall be Allen-Bradley 800T/800H, Square D Company Class 9001, or equal.

Red	Alarms or trips
Green	Motor Running, valve open
Yellow	Pump Call
White	Control Power On

B. Control Relays

480V service control relays shall be industrial type, 600V, with 10A contacts and contact arrangement and operating coils of the proper voltage rating as required by the control circuit sequence and the Drawings. Each relay shall have a minimum of three reversible-pole contacts. The coils shall be sealed by pressure molding. The relays shall be Allen-Bradley 700-P, Square D Company Class 8501 Type X, Eaton D26 Type M or equal.

120V and lower voltage miniature plug in type relays will have indicating pilot light to indicate relay is energized. The relays shall be Allen-Bradley 700-HF, Square D Company Class 8501 Type R, IDEC RR, Eaton D5 or equal.

Timers shall be SSAC TRU3, Allen Bradley 700HX or equal. Multifunction Onboard Selectable Modes of Operation: Delay on Make, Interval, Single Shot, Recycle, Delay on

Break & Retriggerable Single Shot. Six Built-in Ranges from 0.1 Seconds to 1000 Minutes. Multi-voltage Operated From 19-264VAC and 19-30VDC automatically. 10 Ampere Output Contacts- DPDT 11 pin. Onboard LED's to indicate Input and Output Status

C. Terminal Blocks

Intermediate terminations of panel wiring shall be done using modular screw-clamp terminal blocks, rated not less than 20 amperes at 600 V. White or other light-colored marking strips, fastened by snapping numbers into molded sections at each block, shall be provided for circuit designation. Each connected terminal of each block shall have the circuit designation or wire number imprinted on the marking strip with permanent marking fluid. Terminal blocks shall be Weidmuller SAK Series mounted on assembly rail TS 32, Phoenix Series UK mounted on Series NS assembly rail, or equal.

D. Thermostat

Thermostats shall have heavy-duty controls suitable for 120/240V operation. Contacts shall be hermetically sealed and mercury wetted. Units shall include integral thermometer. Enclosures shall be indoor type. Units shall be bellows actuated and shall have removable setpoint adjust knob. Unit shall have minimum adjustable temperature range of 40EF to 60EF and double-pole single-throw switch which opens on temperature rise. Units shall be Mercoid Model 860-54-62 or approved equal.

E. Limit Switches

Limit switches mounted on panel doors for intrusion detection or light activation shall be proximity-type and shall be self contained, side or end sensitive as required. Sentrol 100 series or equal.

Mechanical sensing limit switches for valve position sensing shall be Square D Class 9007 Type C, Allen-Bradley 802T Series, or equal.

F. Pressure Switch

The Bourdon tube pressure switch shall be Mercoid Series DA operated by a brass Bourdon tube actuating a snap action switch rated for outdoor service. Switch shall have deadband adjustable up to a maximum of 100% of switch range. Switch shall have calibrated dial and two pointers indicating set and reset points. Switch shall have visible on/off indication. Set points shall be adjustable without removing switch cover or shutting down process. Pressure switch shall be UL listed and shall be Mercoid Series DA/DS, Model DAW-31-153-7 or approved equal.

G. DC Power Supplies

DC power supplies shall be supplied with proprietary equipment when part of a manufacturer's standard assembly or system.

Direct current supplies for bulk 24V nominal instrumentation power shall be convection-cooled switching type. Line regulation shall be 0.4 percent for line variations from 105 to 132 V, and load regulation shall be 0.4 percent for load variations from 0 to full load. Ripple and noise shall not exceed 100 mV peak-to-peak. Hold-up time at maximum load shall be not less than 16 milliseconds. Efficiency shall be better than 70 percent. Power supply shall be rated for continuous duty from 0 to 50EC at rated load. Connected load shall not exceed 50 percent of the rated load. Output shall be electronically current limited, and over voltage crowbar shutdown shall be provided. Power supplies shall be Acopian B series, Sola Silverline series, Power One International series, or equal.

PART 3 - EXECUTION

3.01 INSTALLATION OF MOTOR CONTROL CENTERS

A complete functional test will held at the shop of the panel fabricator with the MCC and all control components to verify correct functional operation. This test will be witnessed by the owner's representative and the engineer.

Install motor control centers as indicated, in accordance with equipment manufacturer's written instruction, and with recognized industry practices, to ensure that motor control centers comply with requirements.

Prior to energization of circuitry, check all accessible connections to meet manufacturer's torque specifications. Subsequent to wire and cable hook-ups, energize motor control center circuitry and demonstrate capability and compliance with requirements.

3.02 GROUNDING OF MOTOR CONTROL CENTERS

Provide equipment grounding connections, sufficiently tight to assure permanent and effective ground, for motor control centers. All motor control centers will have a continuous ground bus through the entire width of the control center and any control cabinet attached to it. Where the motor control center is attached to a distribution panel or main service panel the continuous ground bus shall be tied to the bus in that equipment.

PART 4 – MEASUREMENT AND PAYMENT

No separate payment will be made for Motor Control Centers. Payment for work in this section shall be included as part of the applicable Lump Sum or Unit Prices stated in other sections.

-END OF SECTION-

SECTION 16430 - TRANSIENT VOLTAGE SURGE SUPPRESSION

PART 1 GENERAL

1.01 SUMMARY

A. Transient voltage surge suppression shall be provided on all main services (Class C) with a 240 KA per phase minimum rating and the secondary main bus of station step-down transformers with an 80 KA rating.

1.02 RELATED SECTIONS

A. Section 16440 Motor Control Centers

1.03 SUBMITTALS

A. Contractor shall furnish submittals for all products identified in this Section.

1.04 MANUFACTURER QUALIFICATIONS

A. The manufacturer of transient voltage surge suppression equipment must have engaged in the design and manufacture of similar equipment for a minimum of 5 years.

PART 2 PRODUCTS

2.01 TRANSIENT VOLTAGE SURGE SUPPRESSION

A. Provide transient voltage surge suppressors suitable for the circuit voltage rating, service equipment, and connected loads.

2.02 SOURCE QUALITY CONTROL

A. The specified system shall be tested to meet ANSI/IEEE C62.41-1991, tested per ANSI/IEEE C62.45-1992.

B. The system shall be tested to 1,000 sequential ANSI/IEEE C62.41 Category C waveforms.

C. The system shall be tested to MIL-STD 220A for electrical line noise attenuation per 50 ohm insertion loss measurement method of RF Frequencies up to 100 MHz.

PART 3 EXECUTION

3.01 INSTALLATION

A. Transient voltage surge suppression equipment shall be installed in accordance with manufacturer's instructions and all applicable codes and standards.

PART 4 – MEASUREMENT AND PAYMENT

No separate payment will be made for Transient Voltage Surge Suppression. Payment for work in this section shall be included as part of the applicable Lump Sum or Unit Prices stated in other sections.

-END OF SECTION-

SECTION 16430 -DRY TYPE TRANSFORMERS

PART 1 GENERAL

1.01 SUMMARY

A. This section provides specifications for dry type transformers.

1.02 RELATED SECTIONS

A. Section 16400 Motor Control Centers

1.03 SUBMITTALS

A. Contractor shall furnish submittals for all products identified in this Section.

B. Shop Drawings: Submit manufacturer's name and data as required:

1. Nameplate Data:
   a. kVA rating.
   b. Nominal primary voltage.
   c. Tap voltages.
   d. Nominal secondary voltage.
   e. Percent impedance.
   f. Weight.
   g. Physical dimensions and mounting requirements.

C. Single Submittal: A single complete submittal is required for all products covered by this Section.

1.04 MANUFACTURER QUALIFICATIONS

A. The manufacturer of dry type transformer equipment must have engaged in the design and manufacture of similar equipment for a minimum of 5 years.

PART 2 PRODUCTS

2.01 GENERAL

A. General Purpose: Transformers for supplying lighting and small power loads shall be premium efficiency dry type, general purpose, two winding, 60 Hertz, copper windings, temperature rise not exceeding 80°C under full load in an ambient of 40°C with Class H, 220°C insulation. Capacity ratings and voltages shall be as shown on the Drawings. Transformers shall comply with all applicable provisions of NEMA Standard ST20 and shall have NEMA Standard taps. Transformers shall be indoor type with sound levels 5 dB below

NEMA Standard or outdoor type with NEMA Standard sound levels. Terminal compartment shall have a temperature rise not to exceed 35°C. Outdoor units shall be equipped with weather shields. Transformers shall be energy efficient type.

2.02 SOURCE QUALITY CONTROL

A. Tests on transformers shall include the manufacturer's standard tests, including winding resistance, ratio, polarity, phase relation, no-load loss, impedance, full load losses, and dielectric tests. Certified copies shall show compliance with all referenced standards.

PART 3 EXECUTION

3.01 INSTALLATION

A. Dry type transformer equipment shall be installed in accordance with manufacturer's instructions and all applicable codes and standards.

PART 4 – MEASUREMENT AND PAYMENT

No separate payment will be made for Dry Type Transformers. Payment for work in this section shall be included as part of the applicable Lump Sum or Unit Prices stated in other sections.

-END OF SECTION-

SECTION 16924 -AC VARIABLE FREQUENCY DRIVES

PART 1 GENERAL

1.01 SCOPE

A. This section provides specification requirements for inverter type adjustable frequency variable speed drives rated 150% FLA for 1 minute or herein identified as VFD drives for use with standard NEMA AC motors. The drive system shall include an interlocked SSRV bypass contactor with line side and load side isolating contactors. A selector switch shall be provided to select either VFD or SSRV operation.

B. The contractor shall furnish, test, install and place into satisfactory operation all AC drives, with spare parts as specified.

C. The manufacturer shall have a nationwide field service and technical support organization available 24 hours a day from an 800 telephone number. Capabilities shall include factory coordinated start-up service and on-site training of customer personnel. Replacement drives shall be stocked in a location within a 24-hour delivery time to the job site.

1.02 RELATED SECTIONS

A. Section 16920 Motor Control Center

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data to include, but not limited to, the following: voltage, phase, amperage ratings, and short-circuit withstand rating.

B. Shop Drawings: Submit layout drawings providing overall dimensions, mounting requirements, and location of field wiring terminations.

C. Maintenance Data: Submit maintenance data including "trouble-shooting" maintenance guide and parts list.

1.04 MANUFACTURER'S EXPERIENCE

A. The manufacturer shall have been specialized in the production of this type of equipment for a period of at least 5 years. The AC drive(s), programmable logic controllers and other electrical gear herein specified, shall be supplied and manufactured by the AC drive manufacturer who shall coordinate and verify their operation.

1.05 QUALITY ASSURANCE

A. Every VFD drive unit shall be designed, constructed and tested in accordance with NEMA, UL, NEC and IEEE recommendations. Every VFD drive and all supplied options shall be UL approved and listed according to UL 508. The controller shall have a UL listed label attached inside the enclosure as verification. The VFD will be NEMA rated and labeled for the horsepower served.

B. The VFD type drive shall be tested with an actual motor load and temperature cycled within an environmental chamber at 122°F (50°C). The frequency output and voltage will be varied throughout the test. Documentation shall be furnished to verify successful completion at the request of the engineer.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Variable speed drives will be Allen Bradley, Cutler Hammer, or Square D. No others are acceptable unless approved by owner.

2.02 DESIGN

A. The VFD drive shall convert the input VFD main power to an adjustable frequency and voltage. The output frequency and voltage of the VFD drive shall be adjustable to maintain a constant V/Hz ratio throughout the operating range. The VFD drive shall be designed to operate from 460v, three phase, 60 Hz main supply that is within +10%, -10% of nominal line voltage.

B. Designs that incorporate silicon controlled rectifiers (SCRs) will not be allowed. The DC bus voltage shall be filtered. The rectifier shall be insensitive to the phase rotation of the AC line and shall not cause a displacement power factor of less than .95 lagging under any speed or load condition.

C. The inverter shall change fixed DC voltage to variable frequency VFD for application to a standard NEMA motor. Paralleling of inverter power devices to increase current rating is not acceptable.

D. Alternate adjustable frequency control drive techniques other than pulse width modulated (PWM) technology will not be considered for motors of 500 horsepower and less.

E. The VFD drive shall be capable of operating into an open circuit without damage in order to facilitate start-up/maintenance.

F. The VFD power heatsink will be vented to atmosphere outside the panel.

2.03 MOTOR DATA

A. The VFD drive shall be designed to operate a standard NEMA electrical motor with a nameplate rating of 460v, three phase power, full load amps as supplied, including a 1.15 service factor at 100% load factor.

1. Motors shall be designed for operation with variable frequency drives. The motor will meet NEMA standard MG1-1993, Part 31.40.4.2. This standard states that the motor should be designed for a peak voltage of 1600 volts at a minimal rise time of 0.1 microseconds for motors rated less than 600 volts.

2.04 RATINGS

A. The VFD drive shall be capable of supplying 150% of rated full load current for one minute at maximum ambient temperature. The VFD drive unit and not just the fuses shall be rated for installation in a power system capable of delivering up to 65,000 RMS symmetrical amperes.

B. The VFD drive shall be capable of operating within -10% to +10% of nominal input voltage rating. The minimum displacement power factor shall be 0.95 throughout the entire speed range. The VFD drive shall be capable of operating without damage with the motor disconnected.

C. The VFD drive efficiency shall be 97% or greater at full speed.

D. The drive shall be rated to operate at 50 degree C ambient air temperature. The drive enclosure will be cooled by redundant cooling fans to ensure the air at the drive electronics does not exceed the 50 degree C rating with an ambient air temperature of 45 degrees C. Drive mounting shall have the heat sink externally mounted from the electronics enclosure with dedicated cooling fans for the heat sink. The drive shall have a high temperature shutdown to turn off drive when maximum operating temperature is reached. Maximum temperature is the highest temperature the drive can run at without component degradation or failure.

E. The drive will be rated to withstand vibration levels of .006 inches displacement with 1G peak intensity. The drive will be rated to withstand shock of 15G peak for 11 MS duration.

F. The input drive frequency tolerance shall be from 48 to 62 hertz.

2.05 ADJUSTMENTS

A. Programmable operating parameters shall be available for all functions through a local programming and display panel.

B. A communication interface shall be provided for a PLC using Modbus, or Devicenet Protocol.

2.06 PROTECTION

A. An adjustable instantaneous over current trip of 220 to 300% of rated output current shall be available

B. Subjecting the controller to any of the following conditions shall activate electronic protective circuits and eliminate component failure or the need for fuse replacement:

1. Short circuit at VFD drive output
2. Ground fault at VFD drive output
3. Open circuit at VFD drive output
4. AC input under voltage and over voltage
5. DC bus over voltage and under voltage
6. Power ride-thru of 15 milliseconds minimum
7. AC line switching transients up to 6000 volts peak per IEEE C62.41-1991
8. Instantaneous current limit
9. Drive over current trip
10. Over temperature/Heat sink thermistor
11. Logic control ride-thru .5 seconds minimum

2.07 CONTROL OPTIONS

A. All operator control options shall be mounted to the front panel, which is integral to the VFD drive. The VFD drive will automatically restart in either Hand or Automatic without the operator giving a manual start command. Supply with VFD:

1. Manual speed adjustment.
2. Hand-Off-Auto (HOA) switch.

3. The controller shall accept an input signal from the PLC as an automatic speed reference signal when the controller is in the automatic mode of operation. The manual speed potentiometer will control the VFD drive frequency when the switch is in manual mode.

2.08 OPERATION FEATURES

A. The VFD drive shall have the option of manual or automatic reset after faults.

B. The VFD drive shall be capable of restarting into a motor coasting in either forward or reverse direction without component failure or tripping off line. The VFD drive shall include static reversing which shall change the output phase rotation to reverse the motor rotation.

C. A slip compensation circuit for loads shall be included which will sense changing motor load conditions and adjust output frequency to provide speed regulation of standard NEMA motors within ±0.5% of maximum speed without tachometer feedback.

D. The VFD drive shall include external fault reset capability. All the necessary logic to accept an external fault reset contact shall be included.

2.09 PILOT DEVICES

A. All operator control options will be mounted to the dead front panel of the drive enclosure cabinet.

B. Front panel pilot lamps.

1. Power On Light.

2. Drive Run Power Light.

3. Drive Fault Pilot Light.

C. Meters.

1. Digital speed meter with selectable ranges from (% of speed, rpm or Hz).

2. Digital output ammeter calibrated 0-150% of current.

2.10 CONTROL REQUIREMENTS

A. Isolated follower with set point control 4-20ma dc with PI control from isolated ground signal or alternately a communication interface for control

B. Relays

1. A start relay shall allow the drive to be remotely started via a 120v ac input.

2. A drive run relay shall provide a dry contact closure for remote monitoring.

3. A drive fail relay shall provide a dry contact closure for remote monitoring.

2.11 HARMONIC ANALYSIS AND POWER CONDITIONING

A. Line reactors designed to limit harmonic distortion to less than 5% shall be provided, installed, and connected.

B. VFD output filters will be included in the installation. This is to prevent voltage reflection.

PART 3 EXECUTION

3.01 STARTUP

The services of a qualified technician shall supervise the installation, testing, and start-up of all the VFD drives furnished under this specification.

PART 4 – MEASUREMENT AND PAYMENT

No separate payment will be made for AC Variable Frequency Drives. Payment for work in this section shall be included as part of the applicable Lump Sum or Unit Prices stated in other sections.

-END OF SECTION-

LANDSCAPING AND IRRIGATION

SYSTEMS LANDSCAPE SITE PREPARATION

GENERAL

Furnish all labor, materials, equipment, facilities, transportation and services to complete "Landscaping" and related work as shown on the drawings and/or specified herein.

The work performed in connection with "Landscape" shall conform to the provisions in Section 20-4 "Highway Planting" of the Standard Specifications and these special provisions.

Summary

The general extent of site preparation includes all areas of construction as shown on the Drawings and includes, but is not limited to, the following:

A. Furnish and install all irrigation, as shown, complete in place, and
B. Furnish and install all plantings as shown, complete in place.

Submittals

Submit proposed site preparation procedures to the City's Engineer for review and approval prior to commencement of work. Procedures should include:

A. List of items
B. Disconnection or interruption of utility services
C. Request for Construction Water from Fire Hydrates
D. Detail description of methods and equipment to be used for each operation.
E. Sequence of operations.
F. Safety procedures regarding work adjacent to occupied structures.

Site Conditions

Traffic: Do not interfere with or close public ways or sidewalks without permission of the City Engineer. Do not interfere with adjacent driveways and private facilities. Conform to Staging Plans and the provisions in the Section on 'Maintaining Traffic' of the Standard Specifications for detouring traffic during construction operations.

Final Clean-Up: Before final inspection of the work, the Contractor shall clean the street, material sites and all grounds occupied by him in connection with the work, of all deleterious materials, rubbish, excess construction materials, false work, temporary structures and equipment.

Measurement and Payment:

Measurement and payment price shall be paid for on a lump sum basis as stated in **Bid Item 27**.

SUPPLEMENTAL WORK

A. Description: The work shall include any new or unforeseen work not specified for in the Plans and Specification. The lump sum dollar amount listed in the bid schedule for Supplemental Work (Bid Item 28) shall be included in each bidder's proposal. Supplemental work shall be performed only upon direct written authorization from the Project Engineer.

B. Measurement and Payment: Supplemental scope of work and price shall be agreed to prior to authorization and shall be paid out of **Bid Item 28.**